



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

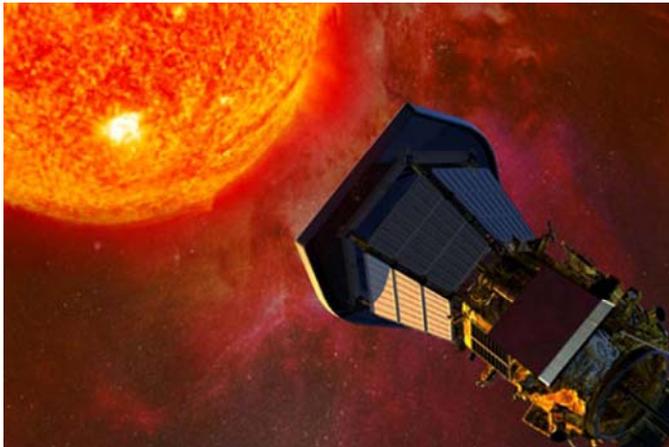
Vol. 26, No. 4 April 2014

This Month's Meeting...

Thursday, April 10th, 2014 at 8:00 PM
Phillips Auditorium

Harvard-Smithsonian Center for Astrophysics

Parking at the CfA is allowed for the duration of the meeting



Solar Probe Plus (SWEAP Investigation). Image courtesy of the CfA

Solar Probe Plus and SWEAP

Our speaker this month will be Dr. Justin Kasper of the Harvard Smithsonian Center for Astrophysics. He specializes in the development of instrumentation for measuring extreme environments from the surface of the sun to the outer solar system and is most interested in exploring the forces driving solar flares and the high energy solar wind continuously streaming away from the sun. He is currently lead investigator for an instrument named SWEAP, designed to measure "Solar Wind Electrons Alphas and Protons". Tonight Dr. Kasper will talk about this project and the upcoming Solar Probe Plus mission to the sun on which it will be flown. Come and learn about this important and exiting mission that will take a spacecraft into the solar corona.

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...

I hope you've all survived the winter months that are effectively behind us. As I sit writing this the sun, now much higher in the afternoon sky, is beaming in and warming my soul. I love winter, the snow, the serenity and peacefulness of a crisp winter sky. But I can't say I love the cold. I'm happy for the warmth, the longer days, and the ability to get back out observing on a more regular basis. I'm sure most of you feel the same.

This month we will be able to see one of the more fun and enjoyable events in the night sky. A total lunar Eclipse. Yes it will be in the wee hours of the morning of the 15th but if it's a clear and calm night it is one of the prettiest most serene things you will see so it is definitely worth the loss of sleep. In my 35 years of observing I've seen four memorable lunar eclipses. They don't come often but when they do they are easy to see and experience. Unlike a solar eclipse this can be seen anywhere - from our local perspective. So no travels; no packing up gear; just set up outside in your yard, on your deck, or balcony for that matter (as long as you face generally South-West.) However you observe, be it with telescope, binoculars or just lying on a blanket just looking up the experience will be one not to be forgotten.

There is another lunar eclipse in October which will also be visible here but not as well placed as it's more of a western US and Pacific region event. There are also two solar eclipses this year. One is an annular eclipse visible in the Antarctica. Hmmm, I wonder if any of you are going to see that one?? The second one is a partial solar eclipse in October following the lunar event. This one will be visible here in New England - not favorably but visible nonetheless. You should take advantage of these as there are many eclipse events listed in the charts for the coming years but not too many, save for the great 2017 total eclipse crossing our country from coast to coast, that will be favorably placed for us East coast dwellers. So look up! This is the year for eclipses.

~ Mike Hill - President ~



Total Lunar Eclipse. February 20, 2008.*

Executive Board Meeting . . .

There will be a board meeting on Monday, May 19th at the Clubhouse in Westford. This will be the annual budget meeting and will begin at 7:30 pm. Any member wishing to attend is welcome to do so.

March Meeting Minutes . . .



Dr. Max Tegmark.*

Minutes of ATMoB meeting held March 13, 2014.

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

Vice President, Neil Fleming called the meeting to order at 8:00 PM.

The Secretary's report of the February 2014 meeting, which was cancelled because of weather conditions, was given by Secretary Sidney Johnston.

Neil gave the Treasurer's report which was prepared by Nanette Benoit.

Tom McDonagh gave the Membership Committee Report.

Glenn Chaple gave the Observing Committee Report and mentioned an upcoming occultation of Regulus. He also talked about the Mars opposition in April.

Bruce Berger also talked about the possibility of observing the asteroid occultation of Regulus' companion star during the main occultation event.

Steve Clougherty gave the Clubhouse Report. He also announced the Messier Marathon scheduled for March 28-29 at the Clubhouse.

Dick Koolish gave a talk on visual observing.

Old Business: None

New Business: It was announced that an asteroid was named after ATMoB member Mario Motta. *Editor: See the article in the March 2014 Star Fields for details.*

Vice President Neil Fleming introduced Dr. Max Tegmark as the invited speaker. The title of Tegmark's talk was "Our Mathematical Universe". Dr. Tegmark is a cosmologist on the faculty of Massachusetts Institute of Technology (MIT). He is the author of a book published in 2014 titled "Our Mathematical Universe, My Quest for the Ultimate Nature of Reality."

The ideas expressed in the book are discussed in detail at the web page:

<http://space.mit.edu/home/tegmark/mathematical.html> .

The talk described aspects of our Universe which indicate that the ultimate nature of reality is that our universe may be a mathematical object. The quest to understand ultimate reality first went to the largest scales, as studied in astronomy. The quest then goes to the smallest scales which can be investigated, presently a subject of study in physics of quantum mechanics and particle physics. In both cases mathematical relationships between observed natural phenomena are found. The convergence of investigations in the largest distances observable and the smallest distance observable of relationships between observations which can be expressed mathematically gives rise to the speculation that at its core, the ultimate nature of reality is mathematical objects.

In the large scales of the Universe studied in astronomy it is a subject of argument as to whether the Universe is 13.7 billion years old or 13.8 billion years old. A few decades ago the argument was between 10 and 20 billion years. That is, the age of the universe is being defined with greater and greater precision.

With the speed of light being a constant for all observers, this makes the radius of the observable universe between approximately 13.7 – 13.8 billion light years. This distance can easily be reduced to centimeters by multiplying the speed of light by the elapsed time. The radius is a lot of centimeters, but it is expressed mathematically.

The outer regions of the Universe that can be observed are seen as the Cosmic Microwave Background (CMB). The CMB is said to produce about 25% of the "snow" that one sees on a television set which is connected to an antenna and tuned to a frequency (channel), with no transmitted radio frequency (electromagnetic waves). The CMB has been studied by antennas mounted on the surface of the Earth, by satellites in orbit about the Earth and about the Sun, and by arrays of antennas connected in a phased array.

Max Tegmark showed a movie of students and faculty (mostly students) assembling a phased array antenna consisting of 128 antennas in a radio quiet valley in Maine. The movie is available as a video at: http://www.youtube.com/watch?v=wGK7t_mTRc .

The object of the antenna is to be a prototype for several larger array antennas which are being built by various countries around

the world. The antennas are designed to measure polarization of the CMB, a property of electromagnetic waves including light and radio waves, where the polarization is thought to be imparted to the CMB by gravity waves left after the big bang beginning of the universe. Detecting the predicted polarization is thought to open a further window into the origin of the universe, especially if the detected polarization looks like that predicted by cosmologists.

Surprisingly, a few days after our March 13th ATMOB meeting, a group led by Harvard CfA astronomers announced detection of the sought after polarization using a radio astronomy antenna mounted at a South Pole station and one mounted on a mountain in Hawaii. A description of this detection is available at: <http://www.cfa.harvard.edu/news/2014-05>

Again, observables at astronomical distances are expressible mathematically. In the CMB polarization case, general relativity predicts the effect of gravitational waves on electrons some 13 billion years ago, Maxwell's equations express the scattering of radio waves emitted by hydrogen at 21 centimeter wavelengths or about 1.4 gigahertz which were scattered by the electrons, and then the waves were stretched by red-shift as the Universe expanded over the intervening about 13 billion years. They are detected at a frequency of about 150 megahertz here on Earth today. The frequency and wavelength of the radio waves emitted by the hydrogen is predicted by quantum mechanics, and so both large and small distance mathematical objects when combined make predictions which have been recently observed. The array antennas will provide ever more precise mathematical representation of the CMB polarization.

At intermediate distances mathematical representations of observations has played a major role in creating the present understanding of physical reality. Galileo studied cannon balls, the pendulum effects of a chandelier in a church, balls rolling down inclined planes, parabola trajectories, etc. Kepler showed mathematical regularity in the Solar System by studying astronomical observations made by Tycho Brahe. Newton developed a mathematical understanding of forces, motion, and gravity. Maxwell developed a mathematical understanding of electricity and magnetism, and also of motions of atoms in thermal equilibrium. Bohr, Einstein, Schrodinger, Heisenberg, Dirac and many others developed quantum mechanics and so gave a mathematical understanding of electrons in atoms as they interact with an atomic nucleus. The interaction of electrons in adjacent atoms provides a reasonable explanation of chemistry. Einstein gave a theory of gravity, and showed that it was good at solar system distances and now it is used at much greater distances stretching into billions of light years. In all of these cases, observations have been put in order as represented by mathematical objects.

The smallest distances probed by physicists have occurred at the Large Hadron Collider (LHC) located in Geneva Switzerland. The baryons, Fermions, quarks, gluons, and assorted other particles of particle physics are arranged in a mathematical arrangement by quantum field theory in a Standard Model of particle physics. One prediction is that jets of particles will be produced when quarks are produced in high energy collisions

between elementary particles in colliders such as at Fermi Laboratory near Chicago, and at the LHC in Geneva. The predicted jets are routinely seen in data from the LHC. Recently a prediction of the Standard Model of Particle Physics that the Higgs Boson should exist has been apparently verified experimentally by a large team of engineers who built the LHC and a large team of physicists who operate the LHC. Again, at the smallest distances which have been experimentally probed, the experimental results are indicative of a mathematical order which describes the Universe at very short distances.

Taken together, the success of mathematical models at both the largest extremes probed by astronomy and the smallest extremes probed by particle physics, nature apparently expresses ultimate reality as a mathematical model. The models are built of mathematical objects.

One of Max Tegmark's conclusions is that since nature appears to be expressible in mathematical objects, and humans can understand mathematical objects, there is a good chance that humans can understand interactions of nature at more and more detailed observations at long distances and short distances. That is, humans can probably understand ultimate reality.

Also, there is apparently no other creature in the Universe that we have found who can understand as much of ultimate reality as is now available to humans.

Perhaps if we do not destroy the Earth by accidental nuclear war, or some other calamity that extinguishes the human race, humans will ultimately understand ultimate reality. That understanding may come through understanding the mathematical objects which today guide our understanding of observations.

The meeting was adjourned at 9:30 PM

~ *Sidney Johnston, Secretary* ~

Astronomy Day 2014 – Save the Date Saturday, May 10 . . .

Join us at the Clay Center Observatory, located in Brookline, with a telescope outside, or a science exhibit inside. Outdoor events 4-10 pm. Indoor exhibits 5-8:30 pm.

This public event drew over 2500 visitors last year and we need your help to provide outdoor telescopes, solar and night, as well as indoor science exhibits.

Look for more information in the May Newsletter.

~ *Submitted by Robert Phinney* ~

Clubhouse Report . . .

March 2014



(L-R) Steve Clougherty and Dave Prowten working on the 25-inch Dob.*

The full moon Saturday work party took place on March 15th through the efforts of Joshua Ashenberg, Bruce Berger, John Blomquist, Jim Bosco, Paul Cicchetti, Daniel Caunt, Steve Clougherty, Nina Craven, Karl and Jeffrey Dean, Jim Gettys, Eric Johansson, Ben Kleschinski, Dick Koolish, John Maher, Mike Mattei, Eileen Myers, Dave Prowten, Cheryl Rayner, John Reed, Bill Robinson, Phil Rounseville, Art Swedlow, Al Takeda, Bill Toomey and student Leanne and Dad John McDonald, Sai Vallabha, Tom Wolf, and Joe Wolfe. A big thanks to these 30 members and friends who made this possible. It was 44 degrees F. and mostly clear. As the day progressed, skies became mostly cloudy with intermittent showers. Activities proceeded as follows:

Steve C. and Dave P. continued final testing of the 25" Dobsonian guided by many nights of star testing. We received many inputs on operational status of the other telescopes as well. Many of the above noted members were part of this testing team. During daylight, further optical testing guided adjustments of the azimuth supports and repositioning of the altitude Teflon support pads. This required a crew of 10 to lift and replace the optical tube with each iteration of adjustment.

Inside, Paul C. applied gallons of glue dissolver, in multiple applications, to the evaporator room floor. Scraping then loosened the glue residue. This sequence will continue at the next work party.

What a difference a month makes. The piles of plowed snow have shrunk considerably;

but the firm footing has given way to slippery mud during daylight hours. Evenings see the ground less spongy, but tire tracks on the observing field show the soft ground areas.

Please be careful if you are considering driving onto the observing field to unload. Test it first on foot.

Even though it is spring we have been hit in the past by Nor-easters brewing off the coast, so we may continue to shovel snow. Remember that we only have one snow blower and many

shovels. We'll need some manpower to keep our observers out there collecting photons.

Sai V. cleared and checked the 17" Dob, John M. opened and checked out new members on the Clamshell 10", Eric J. checked the 6" Schupmann in the roll-off while the 25" Dob work was under way, and Bruce B. continued checkout of the ATMob Research and Imaging Observatory (ARIO) 14" under the home dome. Info gathered at this time was available for the Clubhouse committee meeting following lunch.

Lunch was served by our intrepid crew by 1:30 pm, to allow cleanup before the 3 pm scheduled Clubhouse committee meeting. Prep was handled by Sai, Cheryl, Eric, and John with Nina, Eileen, & Dick assisting. The menu included Salad, Spaghetti & Sauce, garlic bread and dogs. BBQ baked chicken was the devoured fare. Cleanup was handled by the hardy few as outside projects were closed down due to rain.

The committee meeting consumed our time from 3:30 pm – 5 pm and will be reported elsewhere.

The evening found Eric J. mentoring new members on telescope planetary imaging and assembly and Al T. answering camera questions and also helped a new member take astrophotos.

Work will resume at the next full moon work session on April 19th. Please join us. Weekly Thursday evening mirror grinding (except for 2nd Thursday meeting at Harvard), Friday night Astro class, followed by Saturday night observing will continue this month as usual.

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

Clubhouse Saturday Schedule

April 12	CLOSED – NEAF Convention	
April 19	Al Takeda and Bill Toomey WORK PARTY # 4	
April 26	Dave Siegrist + N. and S. Sonawane Messier Marathon # 3	
May 3	Steve Clougherty	Neil Fleming
May 10	CLOSED – Astronomy Day	
May 17	Eric Johansson and Tom Wolf WORK PARTY # 5	
May 24	Paul Cicchetti and John Reed Meteor Shower	
May 31	Nina Craven	Tom McDonagh

Membership Report . . .

Membership count as of March 23, 2014 is at 297 individuals. At the same time last year, membership was calculated to be 288 members in good standing.

I'm excited to introduce our newest members: Dave Stanley, Peter Fitzpatrick, Karin Oberg (Honorary) and Hugo Alvarez.

Please take the time to welcome and introduce yourself to our new members.

The club's communication lifeline includes the ATMOB-Announce and ATMOB-Discuss mailing lists as well as our fantastic newsletter. Please refer to these tools for up to date information on club openings, events and interesting astronomy related discussions. Contact me with questions regarding accessing these options at: membership@atmob.org.

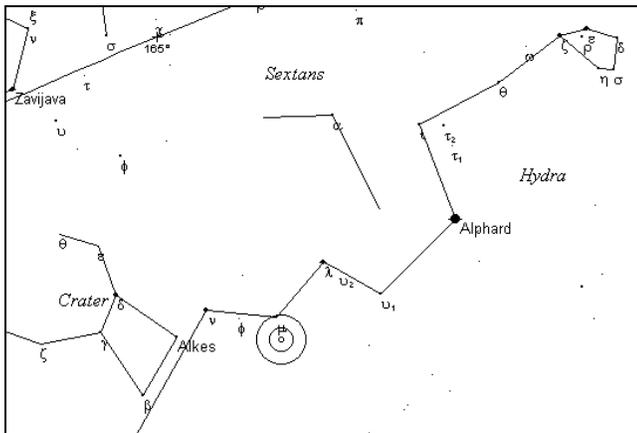
The Amateur Telescope Makers of Boston, Inc. is a 501(c)3 organization. Donations are gladly accepted and are tax deductible to the fullest extent allowed by law. Consider making a tax-deductible contribution to the club during your estate and tax planning this year. Many companies make matching contributions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

~ Tom McDonagh – Membership Secretary ~

Sky Object of the Month . . .

April 2014

NGC 3242 “Jupiter’s Ghost” –Planetary Nebula in Hydra



avila.star-shine.ch/astro/caldwellcharts/c059.htm

From Puppis and the planetary-within-a-cluster combination of NGC 2438 and M46, we move eastward and further south to the solitary planetary nebula NGC 3242. It gets its nickname “Jupiter’s Ghost” because its angular size and slightly oval shape (40” by 35”) approximate those of its namesake planet. Make Jupiter 10 magnitudes fainter and change its color from lively yellow to pale blue-green, and you have NGC 3242 – Jupiter’s Ghost!

Begin your search for NGC 3242 by centering your finderscope on the 4th magnitude star mu (μ) Hydrae, then dropping 1.8 degrees south and slightly west. A low-power search should turn up an out-of-focus 8th magnitude “star.”

What next? If you’re using a small-aperture telescope (4 inches or less), boost the magnification to 120-150X and look for the

nebula’s oval shape and bluish color. Scopes in the 6 to 10-inch aperture range will tease out more detail and capture the 12th magnitude central star. If you prowl the skies with a large-aperture Dob, look for the dark area between the central star and the surrounding bright oval-shaped ring that gives NGC 3242 the overall appearance of (as Arizona amateur Steve Coe notes) the “CBS Eye.”

“Jupiter’s Ghost” was discovered by William Herschel in 1785. Various estimates place its distance and true size at around 1500 light years and one-half light-year, respectively.



Photo by Adam Block /NOAO/AURA/NSF

~ Glenn Chaple – Member at Large ~

Paul Valleli Tours the CfA’s Astronomy Lab . . .



Dr. Dan Fabricant shows the wide-band dual Spectrograph. Photo by Paul Valleli

About two years ago, Dr. Dan Fabricant, of the Harvard Smithsonian Center for Astrophysics (CfA), offered several large slugs of Zerodur for use by telescope makers. Dave Prowten picked up the four 10-inch cylinders and brought them to Dave Kelly for slicing.

Dr. Fabricant told us that the slugs were the centers of several hollow Masers that were built as calibration references several decades ago. He said he might want to make a telescope mirror if he was given one of the slices.

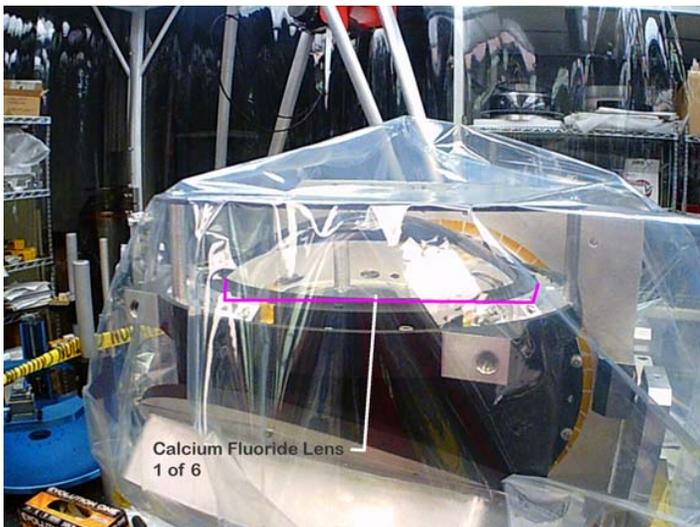
Over the past year Dave Kelly built a diamond saw and made one slice for Dr. Fabricant. He also fine ground and polished all of the surfaces. Dave is an amateur telescope maker (ATM) turned pro and used to be active in ATMoB while he worked at OSTI in N. Billerica. I also assisted Dr. Fabricant many years ago at OSTI while the CfA was building a low cost X-ray telescope.

Dave and his wife, Deb Clogston, made the trip to Cambridge and met me at the Observatory.



Dave Kelly presents Dr. Fabricant with a 10" mirror slice. Photo by Paul Valleli

After the presentation of the mirror blank, Dr. Fabricant took us for a tour of the astronomy lab. The lab is located at the Discovery Center Complex off of Rt. 2. This was formerly the site of the Arthur D. Little Research Labs where many studies were done in preparation for the Apollo Moon Landings.

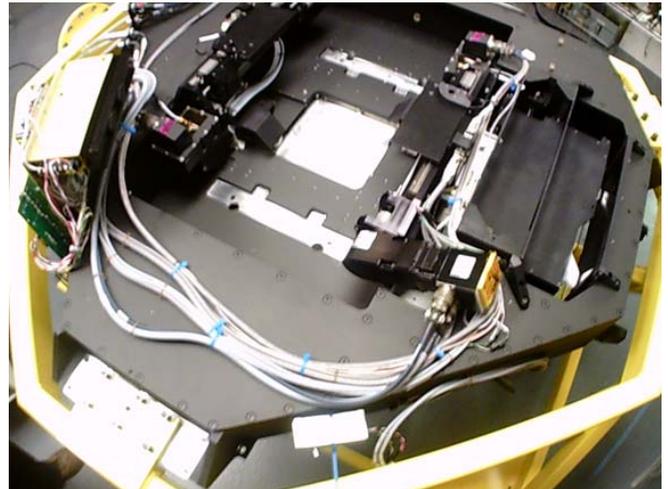


Calcium Fluoride Lens
1 of 6

Calcium Fluoride Lens. Photo by Paul Valleli

Dan told us that CfA is building a wide-band spectrograph for the 6.5-meter telescope that CfA operates in Arizona. It is a replacement for the six element MMT - Multiple Mirror

Telescope. The collimator and camera sections utilize single crystal calcium fluoride lenses about 14-inches in diameter to achieve apochromatic performance. The dual spectrographs were inverted on a rolling pallet for assembly purposes in a clean room. The mounting frame for a dual focal plane CCD was on a separate platform and incorporates translating optical systems that can check focus of the cylindrical focal surface of the spectrograph. When assembly and testing is complete, the unit will be shipped to Mt. Hopkins and attached to the cassegrain focus of the 6.5-meter telescope.



Frame for the Dual CCD Array. Photo by Paul Valleli

~ Submitted by Paul Valleli ~

New Club History . . .



ATMoB mirror making at Schwamp Mill

I have been working on an update for the Club History but I haven't had the time to fuss with it. It needs a Bibliography that I have in written form. There are some parts that are not relevant and need to be deleted. Anyone who has the time to help can either meet with me or I can mail (Postal) a copy for your perusal. Contact me at anna.hillier@verizon.net.

~ Submitted by Anna Sudaric Hillier ~

Acton Star Party Thanks . . .



(L-R) Tom McDonagh and Steve Feinstein setting up.*

The following is a thank you from the program coordinator, Eileen Sullivan.

12th Annual Acton 4th Grade Star Party - What a Night!!

“What an amazing event. I can't thank you all enough for all you did to make the experience so unforgettable for our students. I saw all of the fourth grade teachers this afternoon for a science training, and they couldn't stop talking about it... The clouds cleared away right on schedule- for the second year in a row to open up the heavens for all those excited participants.

Though I never spoke to them, I heard that someone was there from the Beacon and took a picture of at least one of the high school volunteers, so in addition to the piece in last week's Beacon on Galileo there will likely be a story this week as well... I do think there were over 700 attendees. Some teachers reported almost 100% attendance last night.

As always... many, many thanks...”

Eileen Sullivan

We would like to thank members and friends that volunteered for the 12th Annual Acton 4th Grade Star Party at the Parker Damon School in Acton.

Thanks to the indoor presenters; Steve Feinstein, Bob Naeye, Bob Phinney, Cheryl Rayner, George Roberts, Dave Siegrist, Ross Barros-Smith and Bruce Tinkler.

Thanks to the members that set up telescopes; Paul Benni, Bernie Kosicki, John Maher, Tom McDonagh, Eileen Myers, John Reed, Phil Rounseville, Al Takeda and Dave Wolfendale.

Also, thanks to Alan MacRobert (*Sky & Telescope* magazine).

My apologies if I missed anyone. For future reference, please sign up on the ATMoB website so that I can find out who volunteered. Thank you.

~ Submitted by Al Takeda ~

Harvard Elementary School Annual Star Party Thanks . . .



John Maher (center) showing kids the stars.*

Despite a gloomy forecast the Harvard Elementary School Annual Star Party had clear skies and many enthusiastic kids and adults.

Thanks to John Blomquist, Brian, Delaney, John Maher, Tom McDonagh, Eileen Myers, Al Takeda and Bruce Tinkler.



Bruce Tinkler at the ATMoB astronomy information and demo table.*

~ Submitted by Al Takeda ~

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

**May Star Fields DEADLINE
Sunday, April. 20th**

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

Articles from members are always welcome.

POSTMASTER NOTE: First Class Postage Mailed April 4, 2014

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 see www.atmob.org and check your email on the 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 Daylight Time (EDT) from Universal Time (UT) subtract 4 from UT.

Apr 7 First Quarter Moon (Moonset at midnight)
Apr 8 Mars at Opposition
Apr 15 Full Moon, Total Lunar Eclipse
Apr 17 Saturn 0.4° N. of Moon
Apr 22 Last Quarter Moon (Moonrise at midnight), Lyrid Meteors peak
Apr 29 New Moon
May 6 First Quarter Moon (Moonset at midnight), Eta Aquarids peak
May 10 Saturn at Opposition