



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. 22, No. 5 May 2010

This Month's Meeting...

Thursday, May 13th, 2010 at 8:00 PM
Phillips Auditorium
Harvard-Smithsonian Center for Astrophysics
Parking at the CfA is allowed for duration of meeting



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Twenty Years in Space: The Hubble Space Telescope's Greatest Achievements

If you ask some random person “to name a telescope”, the odds are very good that he or she will reply with the “Hubble Space Telescope.” Hubble has completely transformed astronomy since its launch 20 years ago, and it has contributed to a wide variety of fields, from planetary science to cosmology. Join ATMoB member and *Sky & Telescope* Editor in Chief Bob Naeye as he describes some of Hubble's most significant contributions to human understanding of our amazing universe.

Sky & Telescope is the world's most respected and influential popular astronomy magazine, supporting amateur astronomy since 1941. Bob has these same goals, educating and getting people interested in and excited about astronomy. Bob earned a master's degree in science journalism from Boston University in 1992, and later worked on the editorial staffs of *Discover* and *Astronomy* magazine. He served as Editor in Chief of *Mercury* magazine (published by the Astronomical Society of the Pacific) from 2000 to 2003. He worked as a Senior Editor at *Sky & Telescope* from 2003 to 2007, before moving to NASA's

Goddard Space Flight Center to work as a Senior Science Writer for the Astrophysics Science Division. He returned to *Sky & Telescope* in June 2008 to serve as Editor in Chief.

Bob is the author of two books: *Through the Eyes of Hubble: The Birth, Life, and Violent Death of Stars* (Kalmbach, 1997) and *Signals from Space: The Chandra X-ray Observatory* (Turnstone, 2000). He has contributed to two other books, and has won several awards for his writing and outreach activities.

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...

The first time I went to the AstroAssembly convention in Rhode Island was the same year the Hubble Space Telescope (HST) was launched. At the convention, someone had put on display, a six-inch refracting telescope whose objective lens was actually the tool used to grind a six-inch mirror. The poster next to the telescope boasted equivalent views of the then spherically aberrated optics of the HST.

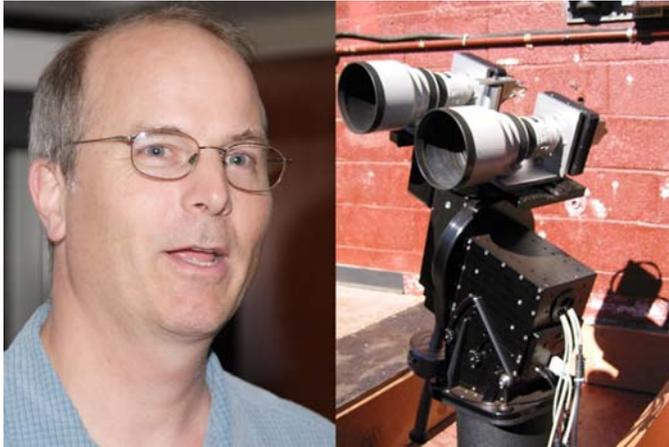
NASA took a lot of criticism and heat in the early days of Hubble. However, they (along with US manufacturers) rose to the occasion to first mitigate (software correction) and later fix (install corrective optics) the HST. As a result, HST is now considered one of NASA's major successes and its original problem is now a footnote in twenty years of successful observations. We can all learn from the way NASA handled the situation two decades ago. In life, something will always go wrong. What really counts is how we handle the problems that come our way – we can be negative, maybe a little panicky, or, we can plow ahead and do what needs to be done – taking our hits along the way.

I had lots of help along the way by many people. I cannot thank everyone in this message but I will mention a few names. My predecessor, Virginia Renehan, gave me guidance in my first few months and gentle nudges along the way when there was something I should be doing. John Maher who started and now runs the Friday night DVD based classes has really brought a wonderful benefit to our club members. Bruce Berger worked tirelessly with Mike Hill to get the new machine shop set-up and then work with Software Bisque to get our C-14 telescope mount upgraded (with the help of John Blomquist and others). John Reed, Steve Clougherty and Dave Prowten have been great in keeping the clubhouse humming along and the new observatory projects moving towards completion. Nanette Benoit has done a great job as Treasurer and her background in accounting has been a real boon to the club. Tom McDonough brought a very personal touch to his role as the membership secretary as he worked with both prospective and new club members. Bernie Volz was always responsive to changes to the website and to being willing to help out in a pinch. Finally Bob Naeye and Dick Koolish have been great help in suggesting names for guest speakers and helping out in getting some of them to come to our meetings.

Clear Skies,

~ Stephen Beckwith, President ~

April Meeting Minutes . . .



(L-R) Dr. Peter McCullough and the XO Survey Cameras

The April meeting of the Amateur Telescope Makers of Boston featured Dr. Peter McCullough of the Space Telescope Science Institute, who is currently on sabbatical at the Smithsonian Astrophysical Observatory in Cambridge, MA. His talk focused on the techniques used to search for extrasolar planets, McCullough's own XO planet project and how amateurs can assist the professionals in this field.

A transiting planet (primary eclipse) means that a planet passes in front of a star. Also a secondary eclipse means when the planet passes behind the star. Dr McCullough noted that "the two different events give us different diagnostic information about the planet."

Dr. McCullough wanted to emphasize the historical importance that scientists have given to measuring transits. He noted that "people have been spending an enormous amount of resources to find and study transiting bodies for centuries." The search for extrasolar planets is continuing this field of study.

The first transiting planets were found by first using the Keck 10-meter telescope to (1) measure radial velocities spectroscopically, (2) follow up with photometry and then (3) to confirm those observations with the Hubble Space Telescope. Dr. McCullough went through the matrix of those three observation methods and noted how many planets have been discovered using different combinations of the three methods.

The method McCullough chose for his XO project was to perform the photometry first with smaller less expensive detectors, then perform spectroscopy and finally use the expensive telescope solution last. Research time on any large aperture or space-based telescope is expensive, so McCullough stated that "we will spend that enormously expensive resource on the best targets."

The XO survey equipment uses a pair of Canon 200mm, f/1.8 lenses attached to pair of Apogee 1024 back illuminated CCD cameras. They sit atop a Software Bisque Paramount German equatorial mount running the software RTS-2 on a Linux platform. Each lens and CCD camera combination corresponds to 25 arc seconds per pixel, 0.4 – 0.7 micron band pass and each gives a 7 degree field of view. The dual lens/camera setup also gives the project redundancy in case of a failure.

Special software algorithms and a lot of compute cycles are used to look for the archetype trapezoidal shape out of the millions of candidate stars in an observing run. However there are more "imposters" that are false positives, small stellar companions, grazing eclipses and eclipsing binaries then there are real transiting planets.

To assist with the vetting process of determining if a candidate is a real planet, the XO project uses an "Extended Team" of advanced amateur astronomers to measure the light curves of the target in question. Dr. McCullough "thanks the amateurs that does the assistance work and the benefit is bidirectional. The amateur collaborators learn stuff for me and I learn stuff from them. It's a classic collaborative arrangement. I need what they've got and they need what I've got."

Those members that are interested in learning how to conduct observations of exoplanet systems should download Bruce Gary's free tutorial from his website brucegary.net/tutorial_exoplanet/ or purchase his book *Exoplanet Observing for Amateurs*.

According to Dr. McCullough, the current plan is to expand the amount of XO telescopes around the world to create 24 hour coverage. The survey will look for exoplanets with periods up to about two weeks. Those telescopes will find candidates and amateurs with high end equipment will be able to join an "Extended Team". They will "make precision photometry of bright stars and help identify those objects which are potentially extrasolar planets from those that definitely are not."

The goal is to cover the entire northern sky with the hope of finding the best candidates for the James Webb Space Telescope before it is launched into space.

Voting took place for the Nominating Committee. See the "Nominating Committee Selection" below for the results.

Al Takeda gave the Secretary's report for April's meeting.

Tom McDonagh gave the Membership Secretary's report.

The Treasurer's report was given by President Steve Beckwith.

The Observing Committee chairman, Steve Beckwith mentioned that the "Black Hole" DVD course is being held at the Clubhouse. Now that the C-14 is operational again users will have to take a course to be able to use the scope. An on-line reservation system will be implemented soon.

The Clubhouse report was given by Steve Clougherty. With warm weather returning work was performed inside and outside of the Clubhouse. The Clamshell was worked on and the Dall-Kirkham was used to observe Mars.

Bruce Berger announced that he would like to get 3-5 Beta testers trained to use the C-14/Paramount. An Announce message will be made asking for volunteers.

April Events:
NEAF – April 17-18
Clubhouse Work Party - May 1

April Star Parties:
80th Anniversary CfA – April 24
Cambridge Sidewalk Astronomy – April 29

New Event Announcements:

- My Favorite Universe Course (Clubhouse) – Fridays (7:30 pm)

New Star Parties:

- Wayside Inn Star Party – Sat, May 8 (7 pm)
- High Plain Elementary School – Mon, May 10
- Astronomy Day at the Clay Ctr. – Sat, May 15 (2:30 pm)
- Geneva Cliffs Star Party – Fri, May 21 (7 pm)

Steve Beckwith thanked Al Takeda for the great job he has performed as Secretary for the last 4 years.

Dick Koolish reminded the membership about the Harvard College Observatory Open Night that occurs every 3rd Thursday of every month.

Mario Motta, while attending a planning meeting for the Council of Science and Public Health of the AMA, proposed that a definitive paper describing available research on light pollution be sent to every member of Congress. “Everyone on the Committee thought that it was a great idea.” That proposal is being considered and will be voted on in a couple of weeks.

Sal LaRiccia announced that he has free Kodacolor film available on the back table.

Ross Barros-Smith announced that the Youth Astronomy Apprenticeship Program has a couple of shows at the MIT Stata Center on April 24th. Information is at <http://yaa.mit.edu>.

~ Al Takeda, Secretary ~

Nominating Committee Selection . . .

By popular vote at the April 8th meeting, the 2010 Nominating Committee was selected. The results are:

Virginia Renehan - Chairperson
Steve Clougherty
Mario Motta

If any member is interested in running for any of the Executive Board positions, please contact any of the members listed above.

Per Articles IX of the ATMoB Bylaws: Members shall have the right to offer additional nominations from the floor of the annual meeting, provided only that a suitable written notice, containing the name or names of the person or persons to be nominated from the floor at the annual meeting, and the signatures of at least Seven members, is filed with the Secretary not less than ten (10) days prior to the date of the annual meeting.

~ Al Takeda, Secretary ~

Clubhouse Report . . .

April 2010

The March 27th Full Moon Work party started at 8:30 am under clear and cool skies. Temperatures started in the mid 30's and climbed to the mid 50's. Twenty eight (28) members and friends donated their Saturday to improving our clubhouse ; our thanks are extended to Tom Wolf, Sai Vallabha, Paul Valleli, Bill Toomey, Al Takeda, Larry Swezey, Art Swedlow, John Small, Sergio Simunovic, John Reed, Dave Prowten, Eileen Myers, Tal Mentall, John Maher, Dick Koolish, Ed Knight, Sidney Johnston, Eric Johansson, Anna Hillier, Nina Craven, Steve Clougherty, Paul Cicchetti, Ed Boynton, Barbara Bosworth, John Blomquist, Bruce Berger and two helpers. This successful work effort accomplished the following:

- The ATMOB History Archiving Group met and started archiving club historical information on multiple computer memory devices to insure any catastrophic event will not put our historical records in jeopardy (Anna H., Paul V., Eileen M., Ed B., Al T.)



Three members of the History Archiving Group (L-R) Eileen Myers, Ed Boynton and Anna Hillier. Image by Al Takeda.

- Clam shell Observatory electrical, mechanical, and optical work continued. Locks, switches, electrical distribution, support systems, entrance ladder system, eyepiece travel, finder systems were addressed. Later in the day the 8" Dahl Kirkham was collimated/ star tested by Phil Rounseville and Mike Mattei. Phil and Mike will have optical quality responsibility for this system; in the future any questions or adjustments will

be under their control. (Steve C., Dave P., Sergio S., John S., Al T., Ed K., Paul C., Bill T., Sydney J., Nina C., John B., John M., Larry S.)



John Small working on the Clamshell dome switch. Image by Al T.

- The home dome platform with the Schupmann mount was inspected and measured to design a temporary shelter for the mount with telescope in place. (Ed K., Eric J., Dave P., John R.)

- Snow fence and stakes were removed and stored in the near barn attic for the summer season. (John M., Paul C., John B., Bill T., Sai V.)

- Bathroom painting was finished, shelves installed, and paint supplies storage completed. (Paul C., Eileen M., Eric J., John R.)

- Old machine shop room table was rebuilt; plaster wall holes filled, and woodwork paint priming started. (John B., Eric J., John M., John R.)

- New machine shop side room (old 4 holer) received the 2nd application of joint compound; subsequent efforts sanded, primed and top coated the new walls. The table saw guide bars were cut to fit the storage space. Measurements were made to allow delivery of the donated milling machine. (Bruce B. and 2 friends, Mike H., Dave P., Sergio S., John S.)

- Three donations were accepted during the day. Tom Wolf donated a 3 step movable stairs which is now being used for the C-14. A hand truck/dolly was donated by The Tool Shed of Waltham Thanks Tom and the Tool Shed. Later in the day we received a surprise visit from Tal Mental; he had just left his home in Clinton with his astronomical treasures not destroyed by the recent Clinton flood. He was now donating his rescued 10" original Meade SCT, 17 volume Hipparcos Star Atlas, 3 volume Burnam Catalog, 2 volume Uranometria Catalog, S&T bound collection, and more. By chance Paul V. and Mike M. were still on site and immediately tackled the job of disassembly, cleaning, and reassembly of the 10" optical tube. It is now ready for optical testing by Paul, Mike and Phil. This awaits more parts recently recovered; originally found missing when the mounting assembly was similarly disassembled, dried, lubricated and reassembled by Sydney J. and Bruce B.

We thank Tal very much for thinking of our club and donating his long treasured items to us for safe keeping and continued use.



John Reed prepares the Bailey Hill spaghetti sauce. Image by Al T.

The last Bailey Hill spaghetti lunch of the season: baked chicken, garlic bread, a Sai Special salad, spaghetti with hearty sauce followed by a dessert cookie selection was provided for 28 hungry folks by our intrepid team: Sai V., Art S., Eileen M., Nina C., Barbara B. The next work session on May 1st will start our summer grill lunch menu of hamburgers, kielbasa, salad, & baked chicken. We'll continue on the clam shell, old machine shop, evaporator room, basement, and new machine shop projects. There is plenty to do, come on up and lend a hand. See you on May 1st. at 10 am.

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

Clubhouse Saturday Schedule

| | | |
|---------|-------------------|---------------------|
| May 8 | Shilpa Lawande | Nitin Sonawane |
| May 15 | Steve Clougherty | Steve Mock |
| May 22 | Bernie Kosicki | Glenn Meurer |
| May 29 | Johansson + Small | WORKPARTY #6 |
| June 5 | Chuck Evans | Tom Lumenello |
| June 12 | George Paquin | Tom Wolf |
| June 19 | Brian Leacu | Phil Rounseville |
| June 26 | Prowten + Takeda: | WORKPARTY #7 |

Thoreau on Astronomy . . .

[Bronson] Alcott is a geometer, a visionary, a Laplace of ethics, more intellect, less of the affections, sight beyond talents, a substratum of practical skill and knowledge unquestionable, but overlaid and concealed by a faith in the unseen and impracticable. Seeks to realize an entire life; a catholic observer; habitually takes in the farthest star and nebula into his scheme.

Journal, undated

~ Submitted by Tom Calderwood ~

Membership Report . . .

Membership as of April 29th, 2010 is 330 members.

Please seek out and welcome our newest and returning members:

Hannah Potter
Andrew Kirik
Joshua Roth

I have ATMOb name cards available for distribution. Do you need a new name tag? Please drop me a line and I will make one up for you. Are you having trouble with your *Astronomy* or *Sky & Telescope* magazine subscription? Please feel free to contact me via email. I'll do my best to sort out any problems.

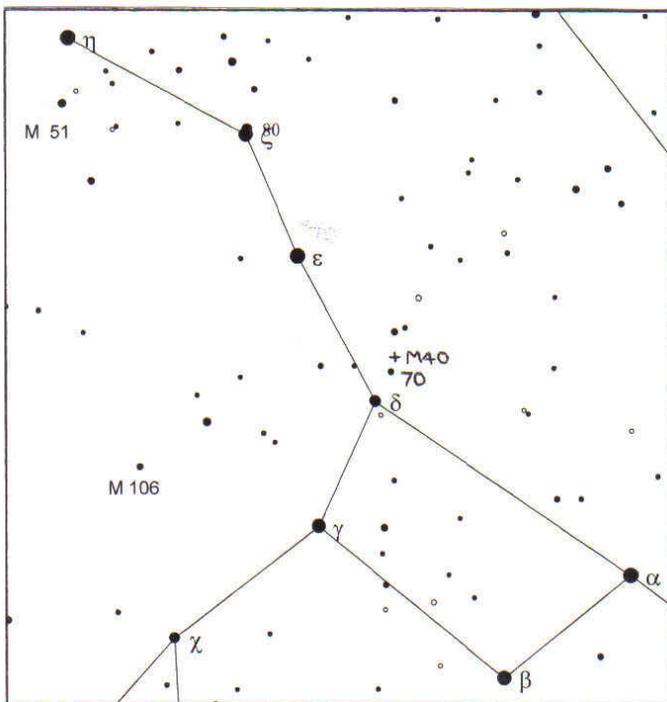
The Amateur Telescope Makers of Boston, Inc. is a 501(c)3 organization. Donations are gladly accepted and are tax deductible to the extent allowed by law. Please consider making a tax-deductible contribution to the club when planning for 2010.

membership@atmob.org

~ Tom McDonagh – Membership Secretary ~

Sky Object of the Month . . .

May 2010 -M40 - the “Unknown” Messier Object



What is the most most-observed deep-sky object in the Messier Catalog? Some might suggest the Orion Nebula (M43) or Andromeda Galaxy (M31), both cosmic showpieces. More likely, it's the Pleiades (M45), a striking and easily observed naked eye cluster.

What about the other end of the spectrum – those Messier objects that receive scant attention? The least-observed might well be Messier 40. Arguably the oddest member of the Catalog, M40 isn't a cluster, nebula, or galaxy. It's a double star! We might well label M40 “Messier's Mistake.”

Messier stumbled upon this stellar duo while searching for a nebulous object reported to be in the area. For some reason, perhaps because it might appear nebulous at low power or in an inferior instrument, he added it to his Catalog. A century later, another comet hunter, Friedrich Auguste Theodor Winnecke, rediscovered the object. He correctly catalogued it as a double star, and it bears the alternate identity Winnecke 4.

Finding M40 isn't a problem. Start at delta (δ) Ursae Majoris, then move about a degree northeast to 70 UMa. In the same low-power field a quarter degree further northeastward is M40. As double stars go, M40 isn't a very inspirational sight. Its magnitude 9.7 and 10.1 component stars are separated by over 52 arc-seconds. Quite likely, it's an optical pair. It may not be one of the night sky's spectacles, but the path to observing all of the Messier objects goes through M40.

Your comments on this column are welcome. E-mail me at gchaple@hotmail.com.

~ Glenn Chaple ~

ATMoB Awards Software Bisque at NEAF . . .



(L-R) Tom Bisque, Steve Bisque and Bruce Berger. Image by Al Takeda

ATMoB presented a token of our appreciation at the NorthEast Astronomy Forum last month to Tom and Steve Bisque for their continuing support of our Paramount and C14 upgrades. Software Bisque has been very generous with equipment, parts and advice through the upgrade process. The framed certificate reads, "The Amateur Telescope Makers of Boston express their deepest appreciation to Software Bisque for their generous support and outstanding contributions to amateur astronomy." Present at the award were (l-r) Thomas Bisque, Stephen Bisque, Bruce Berger and Al Takeda (not pictured). The plaque was signed by ATMOb President Steve Beckwith.

~ Bruce Berger ~

Maria Mitchell Observatory . . .

Summer Opportunities on Nantucket Island. www.mmo.org
Adults and children (ages 11-17). Geology, Scallops, Astronomy,
etc. Education opportunities for all.

(Editor: See Tom Calderwood's report on the Maria Mitchell
Observatory in the March 2010 Star Fields.)

~ Anna Hillier ~

Astronomy Day at the Clay Center . . .



John Briggs shows the spectrum of light at Astronomy Day 2009. Image by Al T.

Astronomy Day 2010 is May 15th!

The year's biggest astronomy-related event in the Boston area is coming up! We'll once again celebrate Astronomy Day at the Clay Center in Brookline. Last year's attendance topped 1,000, and we're expecting even more this year.

The schedule of events is much the same as it has been in the past years, with solar observing during the day and a star party in the evening. One new addition is a "telescope clinic," where families can bring their telescopes for a tune-up and get tips on viewing the night sky. As usual, there will also be demonstrations, planetarium shows, laser shows, rocketry, stunt kites, and hands-on educational activities for all ages. Admission is free.

Here's the schedule:

4:00 pm Outdoor events begin with rockets, kites, solar observing.

5:00 - 8:30 pm Indoor events (lectures, demonstrations, etc)

6:00 - 8:00 pm Telescope clinic

7:00 - 9:00 pm Indoor Kite Flying in the Hockey Rink

8:30 - 10:00 pm Public star party

All ATMob members are encouraged to come enjoy the activities and to help out — please sign up on the website's Events page if you'd like to help with solar observing, evening viewing, or the telescope clinic. For more information, see the listing at <http://claycenter.org> or contact Bob Phinney (rphinney@dexter.org).

~ Submitted by Kelly Beatty ~

For Sale . . .

Orion 6" F5 reflector on modified heavy duty Davis and Sanford tripod with counterweight and Manfrotto quick release. \$240
Tripod bag \$30

Joseph Rothchild 781-744-5412

Students Finally Meet Their Professor . . .



(L-R) Dr. Alex Filippenko, Eileen Myers and Nina Craven. Image by Al. Takeda

Three Friday evening clubhouse seminar attendees (Al Takeda, Nina Craven and Eileen Myers) experienced a thrill on Sunday, April 18th at the Northeast Astronomy Forum & Telescope Show (NEAF) when they finally met, face to face, with Dr. Alex V. Filippenko, Professor of Astronomy at University of California, Berkeley.

The reason they were thrilled is that they had attended, in total, 204 DVD lectures with Dr. Filippenko as professor. It all began in December 2007 when John Maher started hosting astronomy seminars at the clubhouse, 3 or 4 lectures each Friday night, from member-owned DVD's purchased from The Teaching Company. The first course was *Understanding the Universe: An Introduction to Astronomy, 2nd Edition*, consisting of 96 lectures, 30 minutes/lecture. This series was repeated again in November 2008. Then in March 2010 the course was *Black Holes Explained*, 12 lectures, 30 minutes/lecture.

After spending 102 hours watching and listening to Dr. Filippenko, learning about astronomy, groaning at his jokes, and laughing at his goofy T-shirts, the group of 12+ students felt they knew him very well. And at NEAF, Dr. Filippenko, good sport that he is, happily signed a T-shirt similar to his favorite one which he frequently displayed in his lectures.

The shirt will be displayed at the clubhouse for all to see.

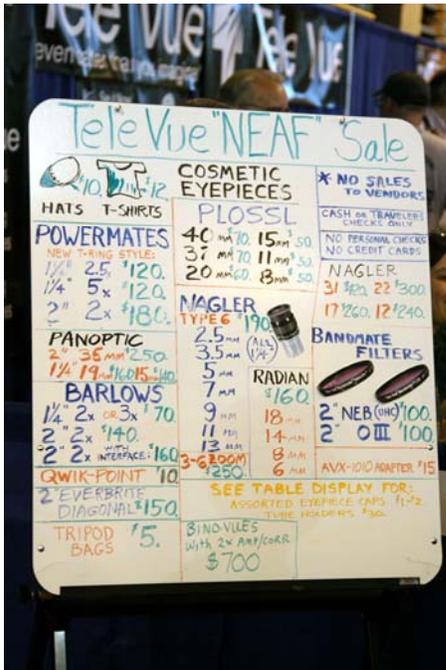
~ Submitted by Eileen Myers ~

Northeast Astronomical Forum ...

Many ATMoB members recently traveled south on our annual migration to the Northeast Astronomical Forum (NEAF) in Suffern, NY. Quite a few of us spent too much, ate too much, filled our brains during the lectures and salivated over all of the expensive toys that we saw on the show floor. We had a great time.

According to Barlow Bob, this year's convention was well attended. NEAF attendance totals went from 4849 in 2009 to 5343 this year.

~ Al Takeda ~



TeleVue had their "scratch and ding" sale this year. Image by Al. T.



(L-R) John Maher and John Reed on the show floor. Image by Al. T.

Announcing StarConn 2010 ...



This year's StarConn will be held on Saturday, June 5th and is presented by the Astronomical Society of Greater Hartford and with the kind and generous cooperation of the Astronomy Department of Wesleyan University. This day-long astronomy "convention" is held at the Science Center at Wesleyan University in Middletown, CT.

Speakers will include:

Edward DeLuca, PhD., Supervisory Astrophysicist of the Smithsonian Astrophysical Observatory in Cambridge, MA.

Charles Blue, Media Relations Specialist for the Thirty Meter Telescope Project. His talk will be "The Thirty Meter Telescope: Astronomy's Next-generation Observatory".

Matt Holman, PhD, Harvard Smithsonian Center for Astrophysics. Title: "The Kepler Mission of Discovery: How Common are Planets Like the Earth?"

Keynote Speaker: Dean Hines, PhD., Senior Research Scientist, Space Science Institute.

Further information can be found at the Astronomical Society of Greater Hartford website, <http://starconn.asgh.org/>.

Registration information and forms can be found at <http://www.asgh.org/starconn/registration.htm>.

A few members of ATMoB will be carpooling down to the convention so if you are interested please place a posting on the ATMoB club list.

~ Submitted by Al Takeda ~

June Star Fields DEADLINE
Wednesday, May 26th

Email articles to Al Takeda at
secretary@atmob.org

POSTMASTER NOTE: First Class Postage Mailed May 6th, 2010

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

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Mike Mattei

OBSERVING AND PUBLIC OUTREACH

STAR PARTY COORDINATOR:
Virginia Renchan 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 Daylight Savings Time (DST) from Universal Time (UT) subtract 4 from UT.

- May 6 Last Quarter Moon – Eta Aquarid Meteor Shower
- May 13 New Moon
- May 20 Venus 0.1 deg. S. of Moon. Moon 0.04 deg S. of M-35
- May 20 First Quarter Moon
- May 25 Mercury at greatest Western Elongation (Morning)
- May 27 Full Moon
- Jun 4 Last Quarter Moon