



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. 24, No. 9 October 2012

This Month's Meeting...

**Thursday, October 11th, 2012 at 8:00 PM
Phillips Auditorium**

Harvard-Smithsonian Center for Astrophysics
Parking at the CfA is allowed for the duration of
the meeting.

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

Measuring Supernovae Distances

This month our speaker will be Professor Bob Kirshner of Harvard University who will speak to us about measuring the distances to supernovae which was the key to the discovery of the accelerating universe that won the 2011 Nobel Prize.

Professor Kirshner earned his Ph.D. in Astronomy at Caltech, performed his post doctoral research at Kitt Peak National Observatory and then joined the faculty at the University of Michigan for 9 years. In 1986 he moved to the Harvard Astronomy Department serving as Chairman of the Department from 1990-1997 and as head of the Optical and Infrared Division of the CfA from 1997-2003. Professor Kirshner has written over 200 research papers dealing with supernovae and observational cosmology as well as a popular book titled "The Extravagant Universe: exploding stars, dark energy, and the accelerating cosmos." His work with the "High-Z Supernova Team" on the acceleration of the Universe was dubbed the "Science breakthrough of the year in 1998" by Science Magazine. The two co-leaders of this team were the ones to receive the Nobel prize based on this work.

President's Message

"Ask not what your country can do for you – Ask what you can do for your country."

I love this quote. It has such powerful connotations and can be applied to any group, be it the entire country or a small recreational club such as ours. It's a call to all of us to pitch in and lend a hand to help ourselves, each other, the collective group in question. All clubs like ours are successful because of the volunteer efforts of their membership. And there are a lot of opportunities for any and all to volunteer. You could serve on the executive board, attend star parties, help out at our work sessions that we have once a month, help out at club events like picnics and open houses or help out on large scale projects like the building of an observatory. And these are just the biggies – clearly defined options where you can commit yourself to our cause in a well defined roll.

But in reality you can help out anytime in numerous small ways as well. "Many hands make light work." This is another of my favorite quotes. I first heard it up at Stellafane on a Sunday morning when one of the volunteers was starting to pull up the poles and string that defined the parking boundaries. I expressed my admiration of his early dedication and how much work must be done to clean up after the crowds had dispersed and this quote was his happy response. And that's the truth isn't it. If we all help out no-one person gets overburdened and the necessary work gets done.

So in addition to the big opportunities for helping out consider that a little help here and there without expressly volunteering can go a long way too. If you get to the clubhouse early on a Thursday evening and the grass needs mowing why not pull out a mower and knock back a section here and there; Or maybe use the weed whacker to trim up some of the edges. If you get there first in the winter-time and it has snowed, then pull out a shovel and shovel off the porch (or at least the steps!!). If the observatory you're working in is getting messy and/or dirty then spend a little time cleaning up before you begin. It all helps. It makes for a better club and we all can take part in big or small ways. And we should. "Many hands make light work."

I must admit that there are many members who already do help out in so many ways. Some much more than others and we should be thankful for all their efforts. I know I am. I myself have tried to do my part and feel I've done a lot but then I look at some of you and marvel at just how much more involved and committed – yes that's the word – committed you are to this club. I thank you, every one of you, for that commitment. We wouldn't be the club we are without your dedication. Cash donations help (of course) but if that's not your thing then consider lending us a helping hand occasionally. We'll all be better off for it whatever task you choose to take on.

~ Mike Hill, President ~

September Meeting Minutes

Minutes of ATMOB meeting held Sept, 13, 2012 .

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 July meeting was given by Sidney Johnston.

Nanette Benoit gave the treasurer's report.

Tom McDonagh gave the Membership Committee Report

Bernie Kosicki gave the Observing Committee Report:

Glenn Chaple discussed particulars of star hopping.

Steve Clougherty gave the Clubhouse Report

Steve thanked the many volunteers who did a lot of work on the clubhouse and the new observatory. Status is that in the Ed Knight Observatory the 20 inch and the Schupmann are working good; the 17 inch Dob is in good condition; the clamshell observatory is ok but the telescope is not so good as the mount does not track. A Meade 10 inch may go into the clamshell.

Bruce Berger spoke about the Pro-Dome (the new observatory) A Meade 10 inch and an 80 mm Williams Optics refractor are going in. Mike Hill mentioned several star parties planned for the next month. Mike also asked for volunteers to help with the Picnic scheduled for Saturday 22 September.

Mike Hill also mentioned that the Lease is final and signed, for a 10 year expiration date and with a 5 year extension agreed to.

Old Business: none

New Business:

Mario Motta mentioned that his extra mirror is going to Italy to a group which will put it in a telescope.

Virginia Renehan mentioned a Night Sky telethon by Internet.

Paul Valleli mentioned that his pictures of Stellafane are on the ATMOB web page.

President Mike Hill introduced Dennis di Cicco as the invited speaker.

Dennis has been photographing the sky for almost 50 years, has worked at Sky and Telescope since 1974, and is now a Senior Editor of the magazine. Dennis has published many Astro photographs.

Dennis gave a talk about astrophotography entitled "The Hydrogen Sky, a Multi-Year Mosaic Project". Dennis and Sean Walker cooperated in the project with Dennis taking the images and Sean Walker doing most of the image processing. The project was to make a hydrogen alpha image of a large area of the sky. A preliminary version of the image appeared on Astronomy Picture of the Day on April 11, 2009, and is at the link: <http://apod.nasa.gov/apod/ap090411.html> .

The image is a two dimensional 5 by 5 mosaic of 25 subframes. The hydrogen alpha image covers the sky from Eastern Puppis at 8.5 hours Right Ascension (RA) to West of the Pleiades, at the Double Cluster. The image runs from Right Ascension (RA) of about 8.5 hours RA to about 3.0 hours RA, giving about 5.5 hours RA. Five and a half (5.5) hours of RA is about 85 degrees. In Declination (Dec) the image covers from about Dec -25 degrees to Dec + 60 degrees, about 85 degrees in declination. So,

the image covers about 85 degrees RA x 85 degrees Dec for more than 6,000 square degrees of sky.

The image is made up of 25 square subframes of 19 degrees on each side with an overlap of 2 degrees to allow registration, for 17 degrees of image in both RA and Dec. The image is thus 5 subframes by 5 subframes, each subframes being substantially square and about 17 degrees on a side. The 5 subframes in a row give an image of about 85 degrees by 85 degrees, again more than 6,000 square degrees of sky. The spherical geometry of the sky must be accounted for in joining the substantially square subframes to make the 85 degree x 85 degree image.

The individual images were taken for 20 minute exposures (3 per hour), and each of the 25 subframes had about 4 hours of exposure. Each subframe is therefore made by stacking 12 individual images.

A medium format camera lens was used with an astronomical CCD camera. The medium format lens has a back focus of about 3 inches, and this length of back focus helped in mating the lens to the astronomical camera.

The images were taken through a 3 nanometer bandwidth filter designed for the hydrogen alpha line at 656.28 nanometers.

As an aside, some of the wavelength shifts affecting use of a 3 nanometer wide filter passband are discussed.

Line broadening of the hydrogen alpha line from collision broadening and thermal broadening is considerably less than the 3 nanometer linewidth of the filter. Doppler shift of hydrogen in the Milky Way Galaxy is also considerably less than the 3 nanometer linewidth.

A motion of about 900 kilometers/second gives a Doppler shift of about 2 nanometers. Motions of the Earth are: from rotation 24,000 miles (1.6 kilometers/mile) in 24 hours or about 1,600 kilometers/hour or about 0.4 km/second; from motion in one year around a circular orbit of radius 93,000,000 miles (radius 148,800,000 kilometers * 2 pi* in 365 days* 24 hours * 3,600 seconds/hour) gives a speed of about 30 km/sec. So Doppler shift due to motion of the Earth in its orbit produces a very small Doppler shift relative to the 3 nanometer filter passband.

Motion of hydrogen in the Galaxy relative to Earth is measured to have a radial velocity of up to 100-200 kilometers/second (J. D. Krauss, Radio Astronomy 2 nd. Ed., Cygnus-Quasar Books, page 8-91, 1986). So, the radial velocity of hydrogen gas clouds gives a hydrogen alpha Doppler shift of about 0.2 to 0.4 nanometers. In conclusion, the filter having a 3 nanometer bandwidth will accept emissions from most of the galactic hydrogen of the Milky Way.

Also, the 3 nanometer bandwidth of the filter stops most of the background light from sky light pollution. The amount of light passing through the filter from hydrogen nebulae is then comparable to or greater than the sky pollution light passing through the filter. A larger passband hydrogen alpha filter such as a 7 nanometer bandwidth simply allows more sky pollution light through but not more hydrogen alpha nebulae light. A

significantly narrower bandwidth filter could stop some of the Doppler shifted nebulae light from more rapidly moving gas clouds. A further conclusion is that a 3 nanometer filter bandwidth is a good choice for making images of hydrogen located in the Milky Way Galaxy.

The geometry of the images had to be adjusted so that the 25 square subframes fit onto a spherical projection of the sky, as the sky is observed from Earth. Also, each of the subframes had optical distortions produced by the lens. Fitting these large substantially square subframes together in a two dimensional array required software which stretches the geometry much as a Mercator projection of a map of the Earth. Wider field of view images were used to create a backbone image. The backbone image was made as a rough mosaic image using a 3x3 mosaic of nine images. The location of stars in the backbone image was used as an aid in placing the 25 subframes into registration. The backbone was helpful because it permitted geometrical adjustments to account for both sky curvature and distortions introduced by the lens used to make the images of the 25 subframes.

Software helpful in making the geometrical adjustments included: "Registrar" for performing registration of images to align stars in the various individual images, that is to "register" the images; the Microsoft program "Microsoft Research Image Composite Editor" (ICE) which is free from Microsoft to fit images together in a panorama; and stacking programs which perform median combine of the registered images. Each of the images had numerous airplane trails recorded in each image, and use of median combine removed the airplane trails from the combined image. The Maxim DL help tab describes "median combine" and "sigma clip" as:

"Median sets the pixel in the resulting image to the median value across the input images. Sigma clip returns either the mean of the input pixels, or the mean of the input pixels with outliers removed, if the standard deviation of the input values exceeds a threshold."

Subtraction of a background gradient of light also helped further reduce remaining sky pollution light from the subframes.

The resulting mosaic image required careful stretching so that the hydrogen alpha light was separated from the background sky pollution light. The software balanced the brightness of the various subframes so that they appear to fit together seamlessly in the mosaic.

A result of the image is that hydrogen appears as spread throughout the galaxy. The hydrogen is dense in some regions, where the dense regions have been both observed and given commonly applied names, and spread thinner between these concentrated locations. Dennis and Sean located at least one dense region in Camelopardalis which does not appear on any known star chart, and so they named it the WD-1 nebulae. Hydrogen was observed in the area of the Pleiades, as it sometimes appears in published photos of the Pleiades, usually as dim red compared with the blue reflection nebulae.

The Mosaic Image taken through a 3 nanometer bandwidth filter gives a very interesting and beautiful perspective of the distribution of hydrogen throughout the Milky Way Galaxy.

Mike Hill mentioned that the 9 inch refractor on the CFA roof is available tonight for observing.

The meeting was adjourned at 9:30 PM by President Mike Hill
~ *Sidney Johnston, Secretary* ~

Board Meeting

There will be a board meeting on October 23rd. It will be held up at the clubhouse in Westford. Members may attend if they wish. The meeting will start at 7:30

Membership Report . . .

Membership count as of 9/24/2012: 158
Same time last year: 221

Membership renewal payments are now overdue as of September 1st. The renewal process can be completed on-line using Paypal. No Paypal account is required.

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

Renewal checks can also be mailed:

ATMoB
c/o Tom McDonagh
48 Mohawk Drive
Acton, MA 01720

I will be available at the October 11th club meeting in Cambridge if you wish to renew at that time. Please make every effort to send along your membership dues payment today! Thanks to all of those that have renewed already. New members as of 2012 are not required to renew till 2013.

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.

Consider making a tax-deductible contribution to the club when renewing your membership.

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

Daniel Temple, Jon Strand, Isaque Dutra
David Demambro, Howard Levin, James Koury
Monika Frerk, Jakob Jorgensen, Dylan Pare

~ *Tom McDonagh – Membership Secretary* ~

Clubhouse Report

September 8th's work session took place under cloudy, hot, humid, sticky conditions; the temperature climbed to just under 90 degrees F. Heavy rain by 4pm dropped the temperature into the mid seventies. In between, several projects were completed by 19 members. A summary:

* In the Pro-Dome observatory, new 1/2" plywood was installed over the 3/4" P.T.plywood sub flooring by Dave Prowten, Paul Cicchetti, Bern Kosicki and David Hinds. This replaced the soft covering tested but found not suitable for equipment movement.

* Meanwhile Bruce Berger applied the second coat of white stain to the exterior of the Pro-Dome observatory and the first coat to the new corner trim boards fabricated by Dave Prowten.

* The Wray 17" dobsonian telescope, rebuilt in August, was repainted by Steve Clougherty, Joshua Ashenberg, Eileen Myers, Sai Vallabha, and Adam Heller (one of member Bill Toomey's students who accepted a community service challenge for extra credit). They then tackled scrapping and wire brushing peeling paint from the metal "Chase hutch" covering the 17" dob.

* Installation of the corner trim boards by Dave P. and Paul C. completed the Pro-Dome observatory construction work. The interior is a work in progress.

* Heavy mowing was stymied by the need of equipment repair. Hand power mowing and weed wacking by David Hinds and Al Takeda finished the mowing job.

* Brush cutting was again necessary at the driveway by Bill Toomey, David Hinds and Adam Heller as was dead limb removal by Bill Toomey and John Reed. The brush pile generated was moved and prepared for future disposal prior to the picnic.

* Electrical conduit sections found deficient at the Chase hutch and the field pier North of the 17" received temporary repair by David Hinds, Adam Heller and John Reed.. Al Takeda and Ben Myers discussed computer problem resolution.

Lunch was prepared, served, and clean up accomplished by Eric Johansson, Art Swedlow, Nina Craven, and Sai Vallabha. Beef patties, turkey dogs, baked chicken, with salad, chips, chili, condiments and cookies for dessert were devoured by the hungry crew. Later everyone appreciated the 15degree drop in temperature.

Additional work was needed to prepare for the picnic on Sep 22nd. John Blomquist again mowed the entire property. Construction debris behind the barn was hauled away by Fred Taylor assisted by John Reed. Another load will be needed. The house was prepared for the picnic by Eileen Myers, Al Takeda and crew. The annual rotation of the composting commode took place under Steve Clougherty's guidance with assistance from Sai Vallabha. The Pro-Dome observatory was in fine shape with inside layout and installation completed under Bruce Berger's guidance. The 17" dob, the 8" Tanguay Dall Kirkham, and the 6" Schupman were enjoyed by viewers. One great surprise was the view of the quarter moon on Picnic evening through the Shapley 20" dob reflector after collimation by Mike Mattei. Super job, Mike; and THANKS.

~ *Clubhouse Committee Chairs* ~

~ *John Reed, Steve Clougherty and Dave Prowten* ~



Joshua Ashenberg, Adam Heller, Eileen Myers and Steve Clougherty painting the 17" Dob

Clubhouse Saturday Schedule

Oct 13	Chuck Evans, Tom Lumenello
Oct 20	Bruce Berger, Mike Hill
Oct 27	Neil Fleming, Bill Toomey
Nov 3	John Panaswich, Dave Siegrist
Nov 10	Henry Hopkinson, John Small
Nov 17	George Paquin, Dave Prowten
Nov 24	Art Swedlow, Sai Vallabha

Pollard School Star Party

The Pollard School Star Party was a great success again this year with record numbers in attendance. The Goudreault family reports that they have NEVER seen as many cars in their parking lot and Dick Goudreault actually counted people doing hayrides and he claims a count of more than 400. Thanks to all of you that came to help out and a special thanks to those of you that persevered through the horrendous traffic on Rte 495 due to a pretty bad accident that night. The kids had a great time and learned a lot. Some of the parents got solid information on what to buy for binoculars, etc. I even heard one adult at the end talking about seeing M11, M13, M57 and now understanding how stars are not only born of huge gas clouds, but also produce gas clouds in their death throes: that's solid education. How many non-astronomers do you usually hear walking around talking about Messier objects by name and grasping the birth - death-rebirth cycles of stars: you guys produced that! Along with the telescopes setup for observing there was a great presentation by High School Teacher Lou Broad, video imaging of the moon, live music and of course plenty of snacks for all. Thanks again for all the help. ~ *Peter Bealo* ~

Annual Club Picnic a Success

After putting up the food tent and activity tents Friday evening, overcast and rainy skies greeted us on the morning of the Annual Picnic, September 22. Fortunately, sun and clear blue skies arrived just before noon as the setup team of Nina Craven, Julie Kaufmann, Eric Johansson, Eileen Myers, John Reed, Art Swedlow, Al Takeda and Sai Vallabha got into high gear, with help from Carl Hein.

We all ate well. Everyone brought food to share, and Chef Eric Johansson was kept busy grilling all day.



Activities for kids were led by Nina Craven, Julie Kaufmann and Eileen Myers, and included making sun catchers, refracting telescopes, solar bead bracelets, and drawing using a Spirograph. Many of the kids sketched a large prominence and other features on the surface of the sun while viewing the sun at the eyepiece. Tossing around a Hoberman Sphere provided much amusement. Bruce Tinkler brought his Astroscan telescope and spoke about astronomy to all of the kids, answering their questions and showing them a selection of astronomy books and star charts.



Everyone sixteen and under received a door prize, with ATMOB family member Kelly winning an 76 mm lightweight f/4 portable tabletop Celestron FirstScope reflector telescope on a Dobsonian-style stand. All of the prizes were donated by club members over

the past few years. Thank you Al Takeda, Julie Kaufmann, Nina Craven and Eileen Myers.

John Maher gave tours of the clubhouse.

Andy Fyfe, who is working on a mirror with his wife Alyssa, provided a mirror grinding demonstration.

The walk-up-the hill was led by Bill Toomey, who provided history, commentary, stories, and lots of jokes. Bern Kosicki provided a ride for the non-hikers.

Telescopes for solar viewing in H-alpha were provided by John Blomquist, Paul Cicchetti, Philip Levine and John Maher. Bruce Tinkler provided white light views of the sun, as did John Blomquist with his dual H-alpha and white light setup allowing viewing of both on a single screen.



The newly painted and re-collimated 17-inch was open for inspection, as were all of the club's observatories.

Evening viewing featured the first-quarter Moon, especially the feature named Lunar X (visible whenever light from the rising sun shines on an elevated area on the Moon formed by the conjunction of four craters near the crater Werner), double stars, ET Cluster, Double Cluster, M13 and other deep sky objects. Thanks go to John Maher for operating the Schupmann, Eric Johansson for operating the 20-inch, and Neil Fleming with his own equipment. Several visitors enjoyed John M.'s constellation sky tour.

The early evening clear skies provided Bruce Berger the opportunity for first light for the C14 and its CCD camera at its new home in the ProDome observatory, allowing for additional fine tuning.

Cleanup was quick with thanks going to all who offered to help out as help was needed throughout the day, and to the terrific cleanup crew led by Julie Kaufmann. We are grateful for the group effort of two families helping to take the large dining fly, led by Al Takeda, with another group taking down the food tent.

Final cleaning was completed on Sunday by Al Takeda, Eileen Myers and Art Swedlow.

I apologize if I forgot anyone. It was a busy day and a good time was had by all.

~ Eileen Myers ~

ASTRONOMY DAY 2013 – MAY 18 – (Preparations begin . . .)

Can you believe this will be the Clay Center Observatory's 10th year partnering with ATMoB to host the annual National Astronomy Day for the greater Boston public?

Over a thousand people attended in the past three years, and last year's total count exceeded 2,000. Astronomy Day 2013 is Saturday, May 18 this year, and with no conflict with NEAF, we hope you will join us. We need your help to provide outdoor telescopes, solar and night, as well as indoor science exhibits. We open rain or shine, so please join us indoors even if the weather is not favorable.

You can register your exhibit, telescope or other, on the website so we may plan for what you need – tables, electricity, food, etc. Go to www.claycenter.org, Astronomy Day page, Exhibitor sign-in. Thank you for your participation!

2013 Astronomy Day Schedule

4:00 - Outdoor events begin with rockets, kites, solar telescopes

5:00 - Indoor events run from 5:00 pm to 8:30 pm - science exhibitors

7:00 - Indoor Kite Flying in the Hockey Rink 7-9 pm - kites that need no wind!

8:00 - Sunset, night telescopes set up

8:30 - Viewing of the first-quarter moon, Venus, Saturn, Jupiter, Mercury

10:00 - Adjourn

Robert F. Phinney, Clay Center Director - Dexter School -- Southfield School
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Sci-Tech Camp: www.sci-tech-camp.org
www.dexter.org, www.southfield.org

Everyone's Universe: A Guide to Accessible Astronomy Places



I have some exciting news to share with the members of the ATMoB

My newest book, *Everyone's Universe: A Guide to Accessible Astronomy Places* (second edition) was released in July. *Everyone's Universe* is an innovative, enabling book that explores ways to provide universal access to astronomy programs such as star parties. Chapters detail strategies for mobility access (for people who use wheelchairs), low vision and tactile access (for people who are blind or visually impaired), specialized environments for people with neurological disorders including autism spectrum disorder, assistive technology for nonverbal communication and non-hearing access for people who are deaf or hearing impaired. A state-by-state travel section of accessible planetariums and observatories is included in the book. The newest (second) edition of *Everyone's Universe* is twice the length of the first edition.

Everyone's Universe was featured in the August 2012 issue of *Astronomy Magazine* and recently received a "highly recommended" review by the National Science Teachers Association. It is available in print and ebook versions (for Kindle, nook and ipad). For more information on *Everyone's Universe* (second edition) and accessible astronomy, please visit www.youcandoastronomy.com.

Noreen Grice, Founder
You Can Do Astronomy LLC

Sky Object of the Month

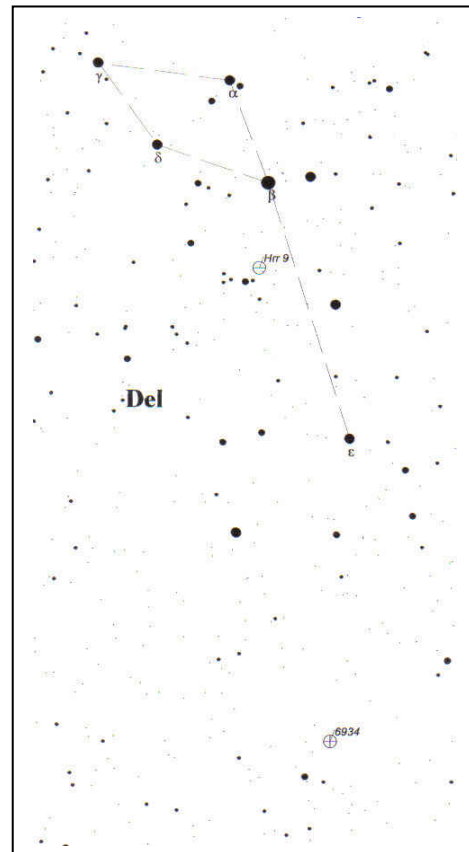
NGC 6934 - Globular Cluster in Delphinus

October sees the demise of the summer Milky Way and its swarm of globular clusters centered on the constellation Sagittarius. A few, notably M15 in Pegasus, lag behind to grace our autumn skies. Another of these stragglers is NGC 6934 in Delphinus. This small 9th magnitude globular was discovered by William Herschel in 1785. In early star atlases and in modern-day "Herschel 400" guides, it bears the designation H1031 - the 103rd entry in Category I (bright nebulae) of Herschel's deep sky catalog.

NGC 6934 may be glimpsed in small scopes. In fact, my only encounter with this globular was with a 3-inch f/10 reflector through which it appeared as a "faint patch of light, but definitely identified." The circular smudge was only a few arc-minutes across and lay just east of a 9th magnitude star. My observing guides, including Kepple and Sanner's *The Night Sky Observer's Guide*, indicate that resolution will require more substantial instruments – 8 to 12 inches for partial resolution of the outer halo, 14 inches or more combined with high magnification for a more definitive view. To that end, my October "to-do" list includes a study of NGC 6934 with medium and large-aperture telescopes. Anybody have an 18-inch Dob handy?

The finder chart, from the *Touring the Universe with Binoculars Atlas (TUBA)* by Phil Harrington shows the location of NGC 6934. Owners of GoTo scopes or traditional equatorially-mounted instruments can lock it in using the coordinates 20h 34.2m, +07o24.2'. Star hoppers will want to try the 4 degree trek southward from epsilon (ϵ) Delphini. Harrington 9 (Hrr 9) is an asterism he found that surrounds and includes the star theta (θ) Delphini.

~ By Glenn Chaple ~



November *Star Fields* DEADLINE
Noon, Sunday, October 21st
Email articles to the newsletter editor at
newsletter@atmob.org

POSTMASTER NOTE: First Class Postage

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How to Find Us...

Web Page: <http://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 ATMob Observatory and 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.
