



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

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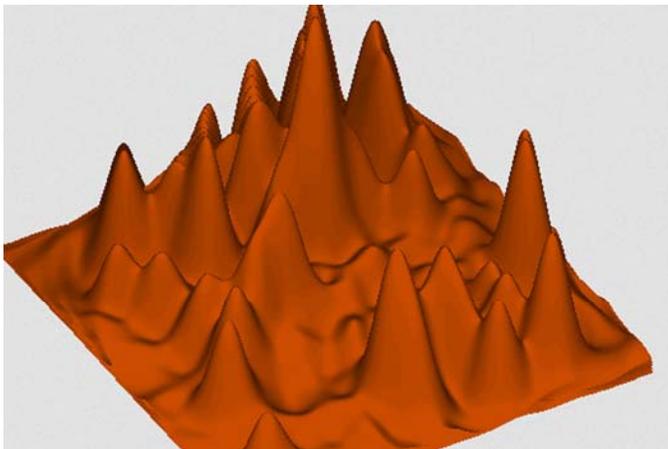
This Month's Meeting . . .

Thursday, March 12th, 2015 at 8:00 PM

Phillips Auditorium

Harvard-Smithsonian Center for Astrophysics

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



Many superposed expanding waves. Courtesy of Daniel Eisenstein.

Dark Energy and Cosmic Sound

This month's speaker is Dr. Daniel Eisenstein of Harvard University. He will talk about how sound waves propagating through the plasma of the Universe, only 400,000 years after the Big Bang, now offer some of our most precise measures of the composition and history of the Universe. In the last decade, we have been able to detect the fossil imprint of these sound waves using maps of the distribution of galaxies from the Sloan Digital Sky Survey. Dr. Eisenstein will give an overview of the cosmological role of the sound waves and our observational program, then describe what the results tell us about the shape of the Universe and the evolution of dark energy.

Dr. Daniel Eisenstein is a Professor of Astronomy at Harvard University. He is Director of the Sloan Digital Sky Survey III and co-Spokesperson of the Dark Energy Spectroscopic

Instrument collaboration. Dr. Eisenstein works primarily in the subject of cosmology, using the large-scale structure of the Universe to study the composition and expansion history of the Universe.

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'd like to tell you a bit about the "CCD Image Processing" training session we had back on Feb 28th. It was very well attended. (In fact, for future sessions, it would be great if someone had a suggestion for a venue with just a little more capacity...some folks were left on the waiting list.)

This first session covered an introduction to CCDStack – my image processing program of choice. (BTW, we have a full license for this installed on the computer up at the clubhouse.) We used some of the "luminance" data that I had on hand of M63. Here is a bit of a reminder of what we covered during our session:

1. First, using our "mark I eyeballs" we culled out the bad images in my dataset. Bad images are those with bad tracking, wind issues, focus/seeing problems, and cloud or moonlight issues. I generally end up ditching up to 40% of my subs – even when taken from a dark sky location like New Mexico. (What can I say...I'm picky!)
2. Secondly, we "calibrated" the images – using a "dark master" to subtract out the individual starting points of each pixel (its bias). We also included a "flat master" that is used to remove the shadows cast by the dust motes on the CCD coverslip window and on the filters. This was done by selecting (Process/Calibrate/Calibrate) in CCDStack.
3. Once that was done, we removed the "blooms" or vertical streaks associated with the bright stars in the image since I used a non-anti-blooming camera (STL-6303) to take the data (Process/Data Reject/Procedures/Reject Blooms), followed by interpolating the missing bloom data (Process/Data Reject/Procedures/Interpolate Rejected Pixels)
4. Now that the individual images (sub-exposures or "subs") had been calibrated, we moved on to the stacking process:
 - a. Register (Stack/Register). We aligned all of the images by "registering" them. We chose the "CCDIS" method since we had the CCDIS plug-in installed, and checked the "use high precision" checkbox. (Choose the Star Match method if not.)
 - b. After we validated that all subs were aligned, we went to the "Apply" tab, and chose to apply the registration results via the "Quadratic B-Spline" algorithm.
 - c. We then balanced the subs – the point where the bottom of the histogram starts for them all. This was done by "normalization" (Stack/Normalize) and choosing "auto" as the method.

d. Then, we got rid of the “outliers” like cosmic ray hits, satellite trails, and airplane trails. This was done by data rejection (Stack/Data Rejection/Procedures). My suggestion is to use Poisson Sigma if you have less than 10 subs, STD Sigma if you have between 10-20 subs, and use Clip Min/Max if 20 or more.

e. Finally, we combined the subs into a “luminance master” by doing a “Mean combine” (Stack/Combine/Mean Combine)

5. We then saved the result (File/Save Data/This) as a 32-bit floating point FITS, and then another copy as a 16-bit Tiff (File/Save Scaled Data/This).

Our next session, to be scheduled shortly, will continue on from here. We’ll do the color channels, then go into Photoshop for a bit of tweaking. For those with patience and desire, we can then do another go-around in CCDStack and show its more advanced capabilities. I hope to see you at these future sessions!

In closing, I’d also like to say how much I enjoyed going to the Acton Star Party this year. It’s been a couple of years since my schedule allowed, and I had a great time. For me (and most of the kids), the highlight of the evening was viewing Jupiter and its four Galilean moons. We saw the transit of Ganymede – both its shadow and the moon itself crossing the face of Jupiter. Also visible was the Great Red Spot, something that our local atmospheric conditions rarely allow for me. Keep an eye out for Virginia’s upcoming Star Party postings and bring out you and your scope if possible. It’s a great time.

Cheers...

~ Neil Fleming – President ~

February Meeting Minutes . . .



Dr. Michael Clarage *

Minutes of the ATMob meeting held on February 12, 2015, in the Phillips Auditorium at the Harvard-Smithsonian Center for Astrophysics.

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

- The Secretary’s Report of the January 2015 meeting was given by Secretary Sidney Johnston.

- Eileen Myers gave the Treasurer’s Report.

- Tom McDonagh gave the Membership Secretary’s Report.

- Glenn Chaple gave the Observing Committee Report. Glenn mentioned many interesting opportunities for observing during the coming months.

- Steve Clougherty gave the Clubhouse Report. He reported that removing snow from the parking areas and the observing field was the primary endeavor this month.

- Old Business: None

- New Business:

Ken Launie brought in some family archival information about Joel Metcalf, amateur telescope maker, builder of 3 of Harvard University’s astrographs and an asteroid discover.

The Acton Star Party is being held on March 2.

President Neil Fleming introduced Dr. Michael Clarage as the invited speaker. Dr. Clarage spoke on the complexities of the Earth’s electrical environment. The Sun and Earth are connected in ways very similar to how man-made electrical equipment is connected. These similarities are examined in light of the idea that the entire solar system behaves as a vast electrical transforming apparatus.

Dr. Clarage received his PhD in Physics in 1992 from Brandeis University, studying the biological and statistical behavior of proteins. Prior to that, he spent several years studying binary pulsars at the Arecibo radio telescope. Over the past 15 years, he has presented public lectures on such topics as Relativity and Dimensions, Metaphysics in Biology Transformation in Supernova and Metamorphosis in Biology. Dr. Clarage is currently a scientist with the International Science Foundation working with the SAFIRE (Stellar Atmospheric Function in Regulation Experiment) Project, exploring the role of electric plasma discharge in solar physics.

Dr. Clarage began the lecture with a video of a bee landing on a flower. A voltage differential, in millivolts, was measured between the flower and the ground from which the plant was growing. As the bee approached the flower, the voltage measured between the ground and the flower dramatically increased. After the bee landed on the flower, the voltage continued to climb. When the bee finished collecting nectar from the flower and flew away, the voltage peaked and then began a rapid decline. This video illustrated that electric fields and voltage differences appear in nature where we usually do not observe them.

Variations in the magnetic field of the Earth were observed in the 1890s, over 110 years ago, by Kristian Birkeland, a

Norwegian scientist. Dr. Clarage showed images of Birkeland with an apparatus with which he sent an electric current against a magnetized iron sphere, representing the Earth, and observed the interaction of the electric current with the magnetic field of the sphere.

A discussion of Birkeland and his experimental apparatus, dated from around 1908, and his observations of currents of electrons flowing across a magnetic field of a magnetized iron sphere, are discussed at:

http://www.plasma-universe.com/Birkeland_current

Birkeland authored a book describing his trips to the Arctic Circle, where he used compass needles to measure changes in the strength of the magnetic field of the Earth during aurora displays (Northern Lights). He concluded that electric current flows in millions of amperes at high elevations above the Earth at the same time as the Northern Lights display occurred. "The Norwegian Aurora Polaris Expedition 1902-1903" in a PDF file is at the link www.archive.org/details/norwegianaurorap01chririch. An online version is also provided.

In the 1970s-1980s satellites in polar orbit measured particle densities, electric fields, and magnetic fields as they passed over the Northern and Southern magnetic poles. A 1978 paper by T. A. Potemra discusses these satellite observations: <http://articles.adsabs.harvard.edu/full/1978Ap%26SS..58..207P>.

Potemra's summary:

"The north and south Polar Regions are the focal points of a great variety of solar-terrestrial interactions. The permanent presence of large-scale Birkeland currents which flow into and away from the lower ionosphere has been confirmed by many rocket and satellite experiments and these observations tend to support Alfvén's original theory for their generation. The total amplitude of these currents is measured in millions of amperes and they play an important role in a variety of auroral and magnetospheric phenomena. Many questions do, however, remain as to the exact source of these currents and even to the nature of the particles which comprise these currents. Simultaneous observations of charged particles, electric fields, and magnetic fields from a single satellite or multiple satellites are required to make substantial progress in understanding Birkeland currents."

Dr. Clarage then showed slides explaining that charge double layers build up as the solar wind interacts with the magnetic field of the Earth. Layers of positive charge substantially increase as spherical shells build up around the Earth, along with enclosing spherical shells of negative charge. The inner Van Allen Belts appeared as a shell of positive charges and the outer Van Allen belts as a spherical shell of negative charge. These shells of opposite charges form an electric double layer of charge surrounding the Earth. These double layers of electric charge interact with the magnetic field of the Earth and with the Solar Wind. The Solar Wind is composed of electrons, which have negative electric charge, and protons, which are hydrogen nuclei, and which have positive electric charge, and that are ejected by the Sun. Complicated interactions develop among these electrical phenomena as the electrons and protons stream into the influence

of the magnetic field of the Earth, and into the charged double layer surrounding the Earth.

One result of these interactions is that the electrons from the Sun develop spiral motions as they follow the magnetic field of the Earth down toward the North and South magnetic Polar Regions, and spiral around lines of the magnetic field. The magnetic effects observed by Birkeland, using compass needles at the surface of the Earth in his Arctic Circle exploration trips, are due to these electric currents. The electric currents are formed from flows of electrons and protons of the Solar Wind. Currents pass down into the atmosphere from the Solar Wind, and then back up toward space.

The interaction of electric currents spiraling around lines of the magnetic field produce streamers of current which wrap around each other, much as strands of DNA wrap around each other. Such twining structures can sometimes be observed in ion tails of comets. Dr. Clarage showed an image of the Veil Nebula showing glowing strands of nebula which wrap around each other.

Dr. Clarage showed slides of other astronomical objects which show apparent electric and magnetic interactions in the plasma (mostly free electrons and protons) surrounding the objects. The objects included the Cats Eye nebula, the M29 Nebula, and the Rectangular Nebula.

In another slide Dr. Clarage showed a computer simulation of a current, or wind, of charged particles interacting with two substantially spherical stationary bunches of other charged particles. The computer simulated interaction shows the wind of particles interacting with previously stationary spherical particles to form rotating bunches of charged particles. The rotation develops arms similar to the arms of a spiral galaxy. Apparently the rotating bunches of charged particles develop arms and a rotation rate that is independent of the radius of rotation of the originally spherical bunch of charged particles. This rotation rate is similar to the observed rotation rate of galaxies. A possible conclusion is that electric plasma interactions may play a role in setting galaxies into the rotation.

Many modern satellites are equipped with instruments to measure magnetic fields, density of particles and, currents of particles, and instruments to photograph the Northern and Southern Lights from orbits higher than the level at which the optical components originate. A circle of glowing light arises around the Earth's magnetic poles as the solar wind particles are guided by the magnetic field until they collide with the upper atmosphere.

Orbiting satellites have also photographed similar rings of glowing light around Jupiter's and Saturn's magnetic poles. See images at the Wikipedia link:

<http://en.wikipedia.org/wiki/Aurora>

The meeting was adjourned at 9:20 PM.

~ *Sidney Johnston, Secretary* ~

Clubhouse Report . . .



Eileen trying the snow blower *

February 2015 Clubhouse Report

And then it SNOWED! Over and over again. The last week of January started it all, and the February Work Party was moved back to January 31st. Fourteen members donated a full day of snow blowing and shoveling and raking snow from roofs; thanks go out to Bruce Berger, Glenn Chaple, Paul Cicchetti, Steve Clougherty, Jim Gettys, Eric Johansson, Mike Mattei, Eileen Myers, John Reed, Phil Rounseville, Art Swedlow, Al Takeda, Sai Vallabha and Joe Wolfe.

The lunch break of hot spaghetti, salad, baked chicken, garlic bread, and dessert was eagerly consumed. Then back out to dig out. Observing was again possible on the pads.

Later, 3 new “A” members received a complete orientation on safety and room by room procedures from a Clubhouse director. The buddy system and safety were stressed. After dark Mrs. Burrier returned her husband Richard’s “A” member key which allowed the last new “A” member to finish his checkout. Each time a key is transferred, it brings back a lot of good memories of observing together at the Clubhouse. Thanks Richard.

And the SNOWS continued.

We met again on Saturday, Feb. 7 for a second work party, which involved more snow blowing and shoveling following the second storm. Dave Prowten completed the final skim coating of plaster in the hallway. A small group of six volunteers met at the Clubhouse on Feb. 14 to clear snow again. At present, the clubhouse is fully accessible, including 10 observing pads for member’s use. The next work party is scheduled for Saturday March 7.

~ Clubhouse Committee Directors ~

~ John Reed, Steve Clougherty and Dave Prowten ~

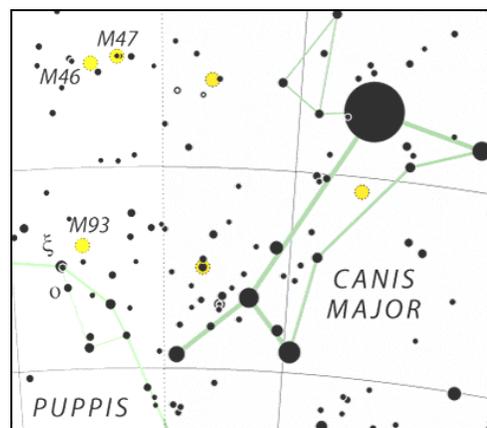
Clubhouse Saturday Schedule

March 14	Steve Clougherty	Karl Dean
March 21	Messier Marathon #1 Art Swedlow + Sai Vallabha	
March 28	George Paquin	Tom Wolf
April 4	WORK PARTY # 5 Glenn Chaple + Joe Wolfe	
April 11	Al Takeda	Bill Toomey
April 18	NEAF & Messier Marathon #2 John Maher + Tom McDonagh	
April 25	Dave Prowten	Dave Siegrist

Sky Object of the Month . . .

March 2015

Messier 47 (NGC 2422) – Open Cluster in Puppis



www.constellation-guide.com (IAU and Sky and Telescope)

Last March, we explored the open star cluster Messier 46 in Puppis. This time around, we turn our telescopes 1 ½ degrees westward to another Puppis cluster – M47. For nearly two centuries, this was one of Messier’s “missing” objects. It was originally discovered by the Italian astronomer Giovanni Battista Hodierna – a forerunner of Messier. Hodierna reported it in a treatise on comets and “admirable objects of the sky,” published in 1654. Hodierna’s work was unknown to Messier, who independently discovered the cluster on February 19, 1771. Messier made an error in plotting its position, and the mistake wasn’t rectified until the mid 1900s.

At magnitude 4.4 and having the apparent width of a full moon, M47 is visible to the unaided eye under dark-sky conditions. It’s a fine sight in binoculars and rich-field scopes, which capture M46 as well. While the latter appears as a hazy patch, M47 has an almost Pleiades-like look. Even a small scope will pick up several dozen cluster members.

Like M46, which houses the planetary nebula NGC 2438, M47 is home to a deep-sky delight of its own. Near its center is the pretty double star Struve (STF) 1121 – a pair of white magnitude 7.0 and 7.3 stars separated by 7.4 arc-seconds. STF 1121 is well resolved when M47 is viewed with magnifications of 50X and up.

M47 is approximately 1600 light-years away and has a true diameter of 12 light-years.



Messier 47 (4.5-inch f/8 reflector at 33X) North is up in this 1.3 degree field. Arrow shows location of STF 1121. Sketch by author

~ Glenn Chaple – Observing Committee and VP ~

Membership Report . . .

Membership count as of February 24, 2015 is at a healthy 300 individuals. At the same time last year, membership was calculated to be 290 members in good standing.

Our newest members include Jennifer and Nathan Finch.

Please also remember to sign up for the ATMOB-Announce and ATMOB-Discuss mailing list for up to date information on club openings and interesting astronomy related discussions. Contact me with questions regarding this option 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 ~

3rd annual Palm Beach County "Dark Sky Festival" . . .

I was the keynote speaker for the 3rd annual Palm Beach County "Dark Sky Festival", primarily organized by Florida Atlantic University. This has grown to be a huge event. This year about 1800 people attended!!! All by local advertising using flyers.

The prime focus was Light Pollution issues, and I was one of 3 speakers. My topic was glare and health effects of nighttime lighting. The other 2 speakers were from Florida State University. One talk was about street lighting and security issues,

and the other was by a turtle expert and how the county ban on beach lighting is saving the turtle population. All of the talks were well done.

In addition to the speakers, there was a star party by the local astronomy group, a bonfire and activities for children, and characters in costumes. There was also a presentation on live owls, discussions of the importance of the dark for animals in general, nature walks, and booths by Sierra Club, IDA, etc, etc.

Lots of planning clearly went into it, and it was incredibly well done. The event was led by activists and the Florida Atlantic University. Physics professor, Dr Eric Vandernoot was the prime mover. He was very generous in letting me stay at his home for the meeting. His 5 year old daughter drew me a picture of the Sun and 2 planets for my observatory!

This shows what a concerted effort by dedicated people can do. It is now an annual event, and gets incredible visibility and support for LP issues in Florida, with great attendance! Lets all try to be a little more active.

By the way, Governor Cuomo of New York, last month signed into law New York's Light Pollution legislation that was passed by the legislature. This means Massachusetts is now completely surrounded on all borders by states with LP laws... we are now the outlier!



Astronaut Mario. Image courtesy of Mario Motta.

~ Submitted by Mario Motta ~

Editor: * Photos by Al Takeda unless otherwise noted.

April Star Fields DEADLINE
Sunday, March 22nd

Email articles to Al Takeda at
newsletter@atmob.org

Articles from members are always welcome.

POSTMASTER NOTE: First Class Postage Mailed March 8, 2015

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

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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 ATMOB-ANNOUNCE list.

CLUBHOUSE: Latitude 42° 36.5' N Longitude 71° 29.8' W

The Tom Britton Clubhouse is open every Saturday from 7 p.m. to late evening. It is the white farmhouse on the grounds of MIT's Haystack Observatory in Westford, MA. Take Rt. 3 North from Rt. 128 or Rt. 495 to Exit 33 and proceed West on Rt. 40 for five miles. Turn right at the MIT Lincoln Lab, Haystack Observatory at the Groton town line. Proceed to the farmhouse on left side of the road. Clubhouse attendance varies with the weather. It is wise to call in advance: (978) 692-8708.

Heads Up For The Month . . .

To calculate Eastern Daylight Time (EDT) from Universal Time (UT) subtract 4 from UT.

Mar 13 Last Quarter Moon (Moonrise at midnight)
Mar 20 New Moon, Vernal Equinox
Mar 27 First Quarter Moon (Moonset at midnight)
Apr 4 Full Moon, Total Lunar Eclipse
Apr 11 Last Quarter Moon (Moonrise at midnight)
Apr 18 New Moon
Apr 22 Lyrid Meteor Shower
Apr 25 First Quarter Moon (Moonrise at midnight)