



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. 23, No. 1 January 2011

This Month's Meeting...

Thursday, January 14th, 2011 at 8:00 PM
Phillips Auditorium
Harvard-Smithsonian Center for Astrophysics
Parking at the CfA is allowed for the duration of
the meeting.

Probing the Universe with Galaxy Clusters: New Windows from New Technologies

Our speaker, Mark Bautz, will discuss recent observations of galaxy clusters that are beginning to provide new information about the history of the cosmos. A key to this progress has been the study of these objects using telescopes operating at millimeter, visible, infrared and X-ray wavelengths. Dr. Bautz will outline the potential impact of these results on our understanding of cosmology, and review some of the new technologies that have made them possible, concluding with a summary of future prospects for this line of research.

Dr. Mark Bautz is a Senior Research Scientist at the MIT Kavli Institute for Astrophysics and Space Research, where he serves as Associate Director. He has been developing instrumentation for X-ray astronomy for over twenty years, and has worked on X-ray cameras for a number of space observatories, including NASA's Chandra X-ray Observatory. His current research interests concern new X-ray imaging detector and observational studies of clusters of galaxies.

President's message...

New Black Hole discovered by amateur [...]. Astronomers using NASA's Chandra X-ray Observatory have found evidence of the youngest black hole known to exist in our cosmic neighborhood. The 30-year-old object provides a unique opportunity to watch a black hole develop from infancy.

Scientists believe that for the first time, they are actually witnessing the birth and growth of a brand new black hole of a specific type. An exploding star was first spotted by an amateur astronomer, Gus Johnson, of Maryland, in 1979. Since this first observation, the star has been repeatedly looked at by orbiting x-ray observatories, and the accumulated story now points to a new black hole that has formed. "This may be the first time that the common way of making a black hole has been observed," according to Abraham Loeb of Harvard, a co-author of the paper describing the new black hole,

As significant as this announcement is, what caught my eye is the role that an amateur astronomer had in this discovery- he noticed the initial event and passed this information on to professionals, who then were able to bring specialized equipment to bear.

Perhaps the biggest organization dedicated to professional-amateur collaboration is the American Association of Variable Star Observers, which was founded in 1911- a century ago- here at Harvard Observatory. Many members belong to and make variable star observations.

A number of our members have been involved in pro-am collaborations; several members have taken part in asteroid occultation measurements within the past few years (and have been recognized in peer-reviewed journal articles), and several others have been involved in the Clay Center Observatory and the Maria Mitchell Observatory work as volunteer astronomers.

Amateurs have been prolific comet discoverers for centuries, but even though this opportunity is starting to fade, with the advent of wide-field robotic professional telescopes, other pro-am opportunities are just starting.

Helping to find exoplanets is an exciting high-end amateur-professional collaboration- the professionals just don't have the telescope time to look carefully at all the promising suns that may have planets revolving around them. This is a very exacting pursuit, but for those with good skills, equipment and the interest there is a recent book "Exoplanet Observing for Amateurs" (see http://brucegary.net/book_EOA/x.htm) and also a web site with suggested stars for observation (<http://www.transitsearch.org>).

More modest but still very useful pro-am work includes continuous weather and photometric observations of the planets in our Solar System, and especially for planets that trend closer to the Sun, where professional telescopes are prohibited to look.

And you can do useful observations even though you may not have any equipment! Data from naked eye observations of meteor showers is useful to the professional community to help pinpoint the radiant and therefore yield information about the distribution of debris in the comet trail that is causing the meteor shower. All you need to do is to have the motivation to take accurate observations and then pass this information along.

Let's remember that two hundred years ago, many- or even most- astronomers were amateurs, self-supported and pursuing astronomy purely for their own satisfaction. Our club is situated close to many professionals and is well known by this community. For those who want to work with professionals, there

are many opportunities for collaboration; the only limit is the time and effort we want to put into it.

Keep looking up.

~ *Bernie Kosicki, President* ~

December Meeting Minutes . . .

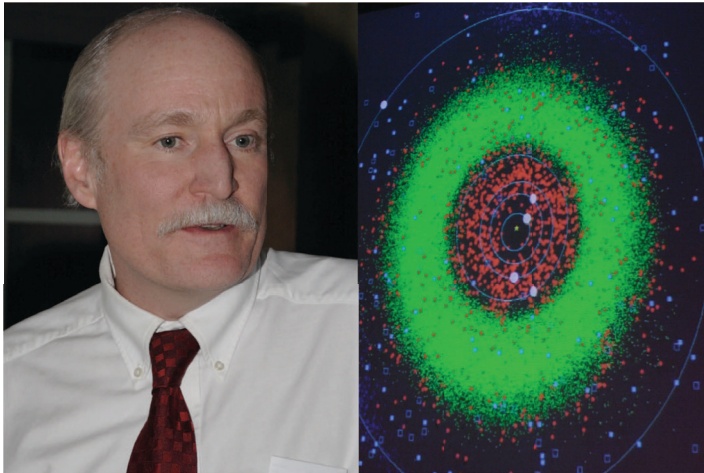


Photo by Al Takeda
Illustration courtesy Dr. Grant H. Stokes

Lecture: “Discovering Near-Earth Asteroids”

The December meeting of the Amateur Telescope Makers of Boston featured Dr. Grant H. Stokes, head of the Aerospace Division of MIT Lincoln Laboratory. He is responsible for the laboratory’s programs in space control and electro-optical systems and technology, and he directs the development and operations of the LINEAR program. Lincoln Near-Earth Asteroid Research (LINEAR) project is a cooperative project between the United States Air Force, NASA, and MIT’s Lincoln Laboratory for the systematic discovery and tracking of near-Earth asteroids. LINEAR has become the world’s premiere asteroid search capability, finding ~50% of the near-Earth asteroids discovered since 1998. Dr. Stokes holds a Ph.D. degree in physics from Princeton University and is a member of the International Astronomical Union.

Dr. Stokes was recently a member of the Air Force Scientific Advisory Board (SAB). He was the Chairman of the 2006 SAB Summer Study on Space Survivability. He chaired the 2006 Science and Technology Review of the VS Directorate of Air Force Research Laboratory and the 2007 review of the Air Force Office of Scientific Research (AFOSR). Dr. Stokes was honored with the Air Force Meritorious Civilian Service Award for his four years of service to the Air Force Science Advisory Board. Dr. Stokes supervised the demonstration of the first space-based space-surveillance system to Air Force operations and has initiated programs to develop next-generation technology for establishing Space Situation Awareness. These programs include the Space Surveillance Telescope, which will provide a 3.5-meter aperture prototype ground-based space surveillance search system, and a program to upgrade the Haystack Radar to W-band operations, yielding high-resolution radar images of satellites.

“Wake Up Call”

Over the past couple of decades researchers have established that asteroid and comet impacts have changed the course of evolution on Earth (notably the asteroid collision of about 65 million years ago). This revelation has resulted in great interest in discovering/cataloging the population of potential Earth impacting asteroids, and has made asteroid impacts a feature of the popular press and Hollywood movies. Dr Stokes began the presentation, “Discovering Near-Earth Asteroids,” with moving images showing the dichotomy of how most people think of the solar system (simple, uncluttered, planetary orbits) and the reality of millions of objects of various sizes filling the spaces people think of as open space. He also commented on some of the known larger objects and summarized some of the known large impact craters including the Chicxulub crater off the Yucatan Peninsula, 65 million years ago, Manicouagan (120km 200 million years ago) and Barringer crater in Arizona (50m Nickel-Iron, 50k years ago).

He put into perspective the large-scale changes that happened to the earth, but also the time scale of the event and the relatively short period of human civilization. He told us that Earth impacts are not unusual. They have happened before, and they will happen again. Recent examples including the impact at Tunguska, Siberia, (a 50m rubble pile) in 1908 and more recently the Peekskill Meteor in 1992 and the impact of Comet P/Shoemaker-Levy 9 in 1994. In 1998, Congress mandated that NASA locate and identify 90% of all Near Earth Objects (NEOs) 1km or larger in diameter by 2008. The success of LINEAR lead to a change in that goal to discover 90% of all NEOs 140m or larger by 2020.

Dr. Stokes presented asteroid impact risk information showing that damage for asteroids of less than 1.26km, the risks in terms of human casualties are relatively small. The damage estimates remain about the same regardless of land or water impact. The asteroid populations can roughly be divided into Armageddon (>7km, ~7@10km), Deep Impact (700m-7km, ~300@2km) and Tanguska (under 700m, ~50,000@140m). Much of the damage from very large asteroids comes from the splashed material from hyper velocity impacts.

The History of Asteroid Discoveries

The first asteroid was discovered in 1801 (Ceres). Others were found but the rate of discovery before the late 1990s was slow due to the painstaking observations necessary to discover them. Technology-wise, photography replaced hand drawn maps in the 1890s. The next big advance was in the 1980s when CCD sensors came into play. Since then, with the automated surveys, with improved sensors and computer processing (late 1990s), discovery rates have skyrocketed. Potential discoveries are reported to the Minor Planet Center (MPC) located at the Harvard Smithsonian Astrophysical Observatory. The MPC maintains web pages of NEOs and lists new NEO candidates for follow up observation and confirmation. There is also a page on potentially hazardous asteroids. The MPC correlates observations of known objects and assigns designations to new discoveries.

“Awareness is the First Step”

Applying Space Surveillance Technology to asteroid/comet detection and impact warning for Earth was identified as a

potential USAF mission by the USAF Science Advisory Board (SAB) report on Space Surveillance, Debris, Asteroids and Comets in 1996. Lincoln Labs developed large format (1960x2560), highly sensitive CCD upgrade for Air Force GEODSS optical space surveillance system. It turns out that this was well suited for asteroid and comet detection and was 10x better than other systems at the time. This was installed on 1 meter wide field GTS-2 telescopes. The system was built at the Experimental Test Site (ETS), Socorro, NM and has been operational since March 1998. The valley location was chosen for its dark skies.

LINEAR telescopes observe each patch of sky 5 times in one evening with most of the efforts going into searching along the ecliptic plane where most main asteroid belt and earth crossing NEOs would be expected. The sensitivity of their CCDs, and particularly their relatively rapid read out rates, allows LINEAR to cover large areas of sky each night. The nightly LINEAR Detection System consists of a composite of 5 raw discovery frames (30 min between frames, 1 square degree per frame, 100 seconds of integration). These images are controlled by a search scheduler and follow-up scheduler which guide the mount and operate the camera control system. The signal processing and detection algorithm takes the input data running it through a registration system, background suppression and normalization, binary quantization, clustering and velocity matched filtering, finally resulting in a detection list.

The search is optimized to find objects in NEO and in the asteroid belt down to better than 20th magnitude. The area searched is about 1200 square degrees a night (entire sky covered in a month). Initially, LINEAR needed to coordinate directly with Brian Marsden and Gareth Williams of the MPC to optimize the reporting. The first month of LINEAR reporting produced 10x the observations of any prior month. The MPC needed to ramp up capabilities once LINEAR began submitting observations because of the sheer volume. LINEAR also imaged where others had not dared to image (e.g. through the Milky Way). LINEAR typically operates 20-25 nights a month, only missing a few days on either side of the new moon.

Dr. Stokes then presented a series of slides showing the progression of LINEAR sky coverage and discoveries made from 1998 through 2009. Dr. Stokes concluded his discussion of the LINEAR program with a chart of LINEAR Discovery Statistics and an animation of asteroid discoveries year by year from 1998 to the present showing the amazing number of known asteroids and their orbits.

The LINEAR system has proven to be a reliable supplier of discoveries of NEOs, comets, unusual asteroids, and main-belt asteroids. In every year it has operated, LINEAR has been a key contributor to the discoveries of large NEOs. LINEAR has discovered more than 2200 NEOs and is responsible for 40% of the observations in the Minor Planet Center's database. LINEAR has discovered more than one third of all known NEAs to date, nearly half of large NEAs, and more than 40% of all known potentially hazardous asteroids. LINEAR has achieved this success by aggressively scheduling the telescopes for as many nights as possible each lunar month and by covering the entire available sky at least once each month. LINEAR has contributed

to the scientific characterization of the NEO population through an analysis of the number, orbital properties, albedo properties, sizes, and impact hazards of the NEO population.

Dr. Stokes commented further summarizing some of the interesting discoveries LINEAR has made. LINEAR does not discriminate about what type of objects are reported, and out beyond Jupiter, comets look just like asteroids. C/1999 S4 Linear, a comet which was discovered in September 27, 1999 by LINEAR, was observed by Hubble to explode and "vanish" on July 26, 2000 (cover article in Science, 18 May 2001). Another interesting object is a comet-like asteroid P/2010 A2 with a tail possibly created by a collision. The downside of prolific discoveries and web-based data being available, however, is the misinterpretation by the media and sensationalisation of "near-miss" passes (e.g. 2004 AS1/AL00667, 17 March 2004 FH, and 99942 Apophis). For asteroids which may pass close, detailed observations are being done to revise orbits and probability of impacts. With increased accuracy of these observations, action can be taken as necessary. For example, the probability of a 2036 impact of 99942 Apophis has been reduced from 1-in-45,000 to 1-in-250,000. We can also observe when these object pass through "keyholes" which indicate likely impact with the Earth.

The "Real" Risk Summary:

The asteroid collision threat is real and programs such as LINEAR are insurance against the risk. As indicated before, awareness is the first step. Next, the threat needs to be characterized (risk to life/property, frequency). Earth atmosphere effectively removes small impactors up to about 50m (depending on composition). Without our atmosphere, the Earth's surface would have a cratered look very similar to the Moon. Then we need to catalogue large objects and propagate orbits over decades to search for possible known risks. In addition, we need to statistical characterize the smaller objects. Finally, mitigation decisions based on understanding of threat can be acted upon. LINEAR's rate of return has lessened because most of what can be found at the current level of technology and sensitivity has already been found. The success of LINEAR's efforts to discover and track NEOs means that the remaining undiscovered NEOs are smaller and dimmer than those previously discovered. Therefore, Lincoln Laboratory's recent and future efforts are geared toward implementing larger telescopes and developing technology to enable more sensitive detection and searches deeper into space, thereby providing a more comprehensive picture of the NEO environment.

Near Passes Recent and Future:

In 2009, 90 known asteroids passed within 5 lunar distances. Often these are reported in the news now that we have good information. On January 13, 2010, AL30 passed by at 122,000 km. This one was discovered by LINEAR on January 10 (one reason for needing ongoing systematic searches). There are currently five known potential impactors of significant size:

Number/Name	Diameter	Chance	Year
9942 Apophis	270m	1/233000	2036
2005 YU55	140m	1/5260	2103
153814	~780m	1/13000	2113
2007 VK184	~130m	~130m	2048
101955	~560m	1/3850	2182

Finally, Dr. Stokes mentioned that MIT Lincoln Laboratory has partnered with Society for Science & the Public to promote science education through the Ceres Connection program. This program names minor planets in honor of students in 5th through 12th grades and their teachers. Students and teachers are selected through the following programs of the Science Education Department at Society for Science & the Public: Discovery Channel Young Scientist Challenge, Intel Science Talent Search (STS), and Intel International Science and Engineering Fair (ISEF).

Business Meeting:

Tal Mentall, member of the club since 1967, became president of the club in 1985. Starting that year, 25 years ago, he began a tradition of presenting his rendition of "Twas the Night Before Christmas" and "The Cremation of Sam McGee" by Robert Service. Tal graced us with another performance this year before the lecture was presented.

Following the lecture, Bruce Tinkler provided the Secretary's Report.

Bernie provided the Treasurer's Report forwarded by Nanette Benoit.

Tom McDonagh provided the Membership Report. He thanked everyone who has renewed. Open enrollment has closed, but renewals and new memberships can be processed at any time. Our current membership is close to what it was at this time last year.

Bruce Berger provided the Observing Committee Report. He jokingly stated that it has been "too cold" for observing. The observing committee is currently doing planning.

Steve Clougherty provided the Clubhouse Report. He indicated the report in the newsletter provides all the details. He went on to summarize the report and announce the next Clubhouse Work Party on December 18th focusing on inside work including work on the Telescope Room, the Evaporator Room, and the basement drain. He also stated that the 20" telescope mount will be rebuilt in the future.

Club Event and Announcements were given by Bernie Kosicki.

- Fridays, Nov 5-Dec 31 Video Course: New Frontiers: Modern Perspectives on Our Solar System, Clubhouse

- Fridays, Jan 7-Feb 11 Video Course: Dark Matter, Dark Energy: The Dark Side of the Universe, Clubhouse
http://www.teach12.com/tgc/courses/course_detail.aspx?cid=1272

- Dec 13 Star Party - Swallow Union School, Dunstable (eventually cancelled)

- Dec 18 Clubhouse Work Party #13

- Dec 31 New Year's Eve Party, Clubhouse 6:30pm

Virginia Renehan announced that there is a Professor at Harvard who needs help with imaging the Dec 20th Lunar Eclipse. Contact Virginia for information.

Virginia also announced the sale of a Celestron CG-4 German Equatorial Mount which was donated by the AAVSO to be used to support the after school program, ITEAM which uses the Harvard CfA micro-observatories for four schools. The program would like to buy big dobsonians (8") for the schools which would stay with the program.

Charlie McDonald discussed the progress of STEM based education in Reading. He told us that he had established STEM based libraries at the town library and schools with a \$3k investment which was matched by the Bank of America Foundation. These are the first STEM based libraries in the country. Hopefully these investments will inspire students to stay with STEM based subjects in order to meet the technical needs of companies in the US. Many high tech companies in the US are finding it difficult to fill needs for engineers, etc. Charlie also reminded us that the US is falling behind in ranking for STEM based tests for 14 year olds. Bernie followed Charlie's comments with some background on Charlie's efforts and congratulations on his achievements and successes.

Ross Barros-Smith announced a web-based Newsletter to come as well as an "extra." He requested members provide him with some of their astrophotography the story of their equipment. Ross also announced that he had a visiting student whom he wished to introduce to certain members.

Eileen Meyers announced all the RASC Observer Handbooks in the current order had been sold, but she would collect names of those interested in an addition order on a sheet at the meeting and by email. She also announced that plans were progressing for the New Year's Eve Party including clubhouse decoration to begin the Sunday before. Everyone is invited and is encouraged to bring family and friends. There will be games, food and fun!!!

Gary Walker announced the sale of 100th anniversary AAVSO Calendars.

Bernie Volz announced the sale of Astronomy Calendars to benefit the club.

Additional comments were made by members about Jupiter observations and the re-appearance of the Southern Equatorial Belt, especially visible on the non-Red Spot side (Joseph Rothchild). And a presentation was made of an occultation observation lasting 11 seconds (Paul Valleli).

Refreshments were provided by Tom McDonagh.

~ *Bruce Tinkler, Secretary* ~

Clubhouse Report . . .

Projects reported in the last issue of Starfields continued to progress during the December 18th work session at the clubhouse. Without outside temperatures in the 20's, work centered on the far barn, clam-shell observatory, metal tool shed, and inside the old machine shop.

Ladders were stored for the winter; the deflated wheelbarrow tire removed for repair/replacement; lawn mowers run out of gas and stowed; used wood pieces cut up for disposal; the far barn East doors trimmed to allow full opening over the concrete exterior walkway. Al T., Paul C., Sai V., and John R. worked this effort. -- In the clamshell observatory the motor and gearbox were removed from the R.A. drive system; were cleaned, lubed, reassembled, reinstalled and tested while observing Jupiter later that evening. The need for further work was identified. Steve C., Dave P., Glenn M., John M., and John B. worked this problem. --- In the metal tool shed wires were pulled, fixtures attached and connected, and may be ready for hook up and testing after a few more sessions. This was worked by Sergio S. and John M. --- The first of the season Bailey Hill spaghetti lunch was prepared and served while work proceeded on organizing the S&T historical archives by Bruce B. and Al T. Spaghetti with the special sauce, garlic bread, and Sai's salad creation was devoured by a hungry crew. This was worked by Sai V., Eric J., Art S., and John R. Cleanup is an necessary part of this effort and Eric and Sai did yeoman's work here. Intermittent solar observing was provided by Paul C.'s H-alpha system; long filaments were the most obvious feature throughout the day. --- In the old machine shop room work continued. Patched walls were sanded; walls and woodwork were primed and painted; the first window was transformed into a light tight bulletin board; the butcher block table defects smoothed with wood filler, sanded and covered with two coats of clear urethane. The previously painted cabinet was mounted on the chimney wall. This project continued through the efforts of Joshua A., John B., Dave P., Eileen M., and John R.



Photo by Al Takeda

New member, Joshua Ashenberg paints new telescope room.

Thanks go to J. Ashenberg, B. Berger, J. Blomquist, P. Cicchetti, S. Clougherty, E. Johansson, J. Maher, G. Meurer, E. Myers, D. Prowten, J. Reed, S. Siminovic, A. Swedlow, A. Takeda, and S. Vallabha for making this work party a success.

The next work session is on the Saturday nearest full moon, in January on the 22nd starting at 10am. Come on up and join us. You are welcome.

~ Clubhouse Committee Chairs ~

~ John Reed, Steve Clougherty and Dave Prowten ~

Clubhouse Saturday Schedule

December 25	CLOSED Christmas Day	
January 8	Cicchetti	Reed
January 15	Jacobson	Johansson
January 22	Maerz	Meurer
Work Party #1		
January 29	Evans	Lumenello
February 5	Panaswich	Small
February 12	Berger	Hill
Work Party #2		
February 19	Leacu	Rounseville
February 26	Clougherty	Mock

Thoreau on Astronomy . . .

It is a fair sunset, with many purplish fishes in the horizon, pinkish and golden with bright edges; like a school of purplish whales, they sail or float down from the north; or like leopards' skins they hang in the west. If the sun goes behind a cloud, it is still reflected from the least haziness or vapor in that part of the sky, the air is so clear; and the afterglow is remarkably long. And now the blaze is put out, and only a few glowing clouds, like the flickering light of the fire, skirt the west. And now only the brands and embers, mixed with smoke, make an Indian red along the horizon. The new moon and the evening star, close together, preside over the twilight scene.

Journal, 23 January 1852

~ Submitted by Tom Calderwood ~

Sky Objects of the Month . . .

Sky Object of the Month – January 2011

Uranus

What's your favorite planet? How about your top three? Most likely, Uranus isn't one of them. While it's hard to ignore the intriguing detail presented by Jupiter and Mars or the visual splendor of Saturn and its rings, Uranus possesses an ethereal beauty that none of them can match. Its almost mystical bluish hue stands out in stark contrast to the dark background sky. To me, Uranus is reminiscent of similarly-hued planetary nebulae like NGC 7662 (the "Blue Snowball") in Andromeda.

Although it inhabits the outer reaches of the solar system, Uranus is bright enough to be viewed with binoculars and small telescopes. With a magnitude of +5.8, it can even be viewed with the unaided eye under ideal dark-sky conditions. To see the planet's tiny 4 arc-second disk, equal to the apparent size of a golf ball 1.3 miles away, you'll need a telescope that can handle magnifying powers in excess of 100X.

If you've been avoiding Uranus because it's harder to locate than the bright naked eye planets, you're in luck. Since mid-2010, Uranus has been undergoing a triple conjunction with Jupiter. The final stage of this cosmic dance is about to commence. During the waning days of 2010 and first week of 2011, Jupiter and Uranus will be close enough to view together in a one-degree-wide telescopic field.

This month (January 24th, to be precise) marks the 25th anniversary of the historic flyby of Uranus by the Voyager 2 spacecraft. Celebrate the event with your own visit to the seventh planet.

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

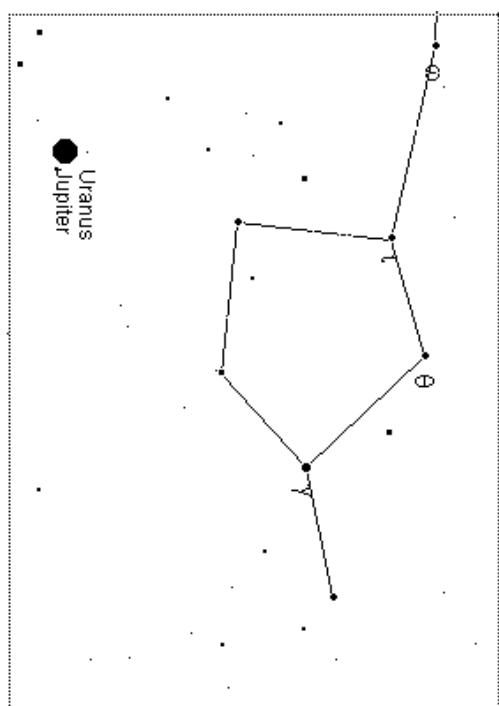


Image created by Glenn Chaple w/ Cartes du Ciel
Uranus and Jupiter – January 2, 2011

~ Submitted by Glenn Chaple ~

MoS Boston Planetarium Reopening Next Month . . .

Sofiya Cabalquinto at the Museum of Science wrote to the club to report on their planetarium's imminent return to service on February 13th.

"Greetings from the Museum of Science! I have some exciting news to share that I thought would interest Amateur Telescope Makers of Boston members.

After a yearlong, \$9 million renovation, this February the Museum of Science will unveil the newly transformed Charles Hayden Planetarium – now New England's most technologically advanced digital theater, featuring a state-of-the-art Zeiss Starmaster and digital Sky-Skan Definiti System. As part of the opening, the Museum will present the world premiere of our original astronomy show that will explore the science of exoplanets, "Undiscovered Worlds: The Search Beyond Our Sun." As you know, with NASA's Kepler mission focused on finding Earth-size planets, we are closer than ever to answering a fundamental question: Are planets like Earth common or rare? With input from physicist-novelist Alan Lightman and leading exoplanet researchers from MIT and the Harvard-Smithsonian Center for Astrophysics, Undiscovered Worlds captures the excitement of this search and invites audiences to join the hunt.

Also, I thought members might be interested in a social fundraising endeavor for the Planetarium that we are running online. We'd like to dedicate the Planetarium's "best seat in the house" to our Facebook fans. If we meet our goal, fans would be eligible to win free Planetarium show passes, access to VIP events, and get the inside scoop on planetarium updates and events. It also means that Facebook fans would have a particular seat named in their honor (nameplate and all); it's a seat that the Planetarium team has chosen for its excellent views of the dome, the presenters, and the area that converts into a stage for live performances. We'll also have a dedication party to celebrate. Here is a link to more information: <http://bit.ly/9y3cBX>"

Sofiya goes on to add that a press and VIP preview will be held on February 9th and that invitations will be sent shortly. A full press release can be found online at:

http://www.mos.org/visitor_info/museum_news/press_releases&d=4771

~ Submitted by Ross Barros-Smith ~

Next round of CfA Observatory Nights Announced . . .

The Public Affairs Office at the Harvard-Smithsonian Center for Astrophysics have posted their series of events for this spring online. In addition to their usual Monthly Observatory Nights (held each third Thursday of the month at 7:30PM), two Sci-Fi Movie nights are planned, including *Back to the Future* (Thursday, May 5) and *Moon* (Friday, May 6). Full details are available online at:

http://www.cfa.harvard.edu/events/public_events.html

~ Submitted by Ross Barros-Smith ~

Symbiotic Variable Star on the Verge of an Eruption?



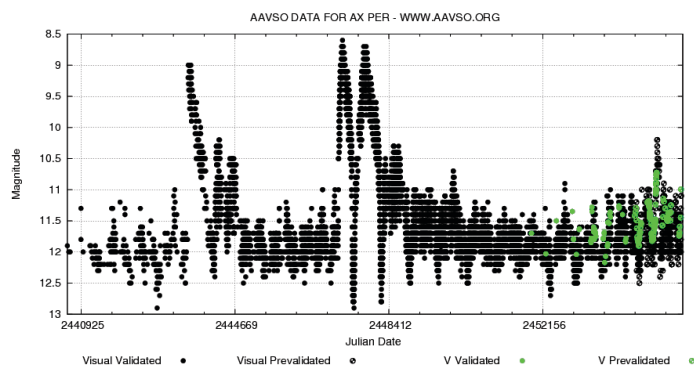
Image by NASA

Symbiotic variables are binary pairs in orbit around each other inside a common envelope.

November 23rd, astronomers from the Asiago Novae and Symbiotic Stars collaboration announced recent changes in the symbiotic variable star, AX Persei, could indicate the onset of a rare eruption of this system. The last major eruption took place between 1988 and 1992. In the (northern hemisphere) spring of 2009, AX Per underwent a short outburst that was the first time since 1992 this star had experienced a bright phase. Now AX Per is on the rise again. This has tempted astronomers to speculate that another major eruption could be in the making.

Symbiotic variable stars are binary systems whose members are a hot compact white dwarf in a wide orbit around a cool giant star. The orbital periods of symbiotic variables are between 100 and 2000 days. Unlike dwarf novae, compact binaries whose periods are measured in hours, where mass is transferred directly via an accretion disk around the white dwarf, siphoned directly from the surface of the secondary, in symbiotic variables the pair orbit each other far enough away that the mass exchanged between them comes from the strong stellar wind blowing off the red giant. Both stars reside within a shared cloud of gas and dust called a common envelope.

When astronomers look at the spectra of these systems they see a very complex picture. They see the spectra of a hot compact object superimposed on the spectra of a cool giant star tangled up with the spectrum of the common envelope. The term "symbiotic" was coined in 1941 to describe stars with this combined spectrum.



(Opposite column.) The AAVSO light curve of AX Persei from 1970 to November 2010. In the middle is the eruption of 1988-1992. The precursor outburst is the sudden narrow brightening left of the larger eruption. To the right of the light curve you can see the 2009 brightening event. Is this a precursor to a coming major eruption?

Typically, these systems will remain quiescent or undergo slow, irregular changes in brightness for years at a time. Only occasionally do they undergo large outbursts of several magnitudes. These outbursts are believed to be caused either by abrupt changes in the accretion flow of gas onto the primary, or by the onset of thermonuclear burning of the material piled up on the surface of the white dwarf. Whatever the cause, these major eruptions are rare and unpredictable.

AX Per underwent a short-duration flare about one year before the onset of the major 1988-1992 outburst. Now astronomers are tempted to speculate. Could the 2009 short outburst be a similar precursor type event? The present rise in brightness by AX Per might be the onset of a major outburst event similar to that in 1988-1992. The watch begins now, and professional and amateur variable star observers will be keeping a close eye on AX Per in the coming months.

Ranging from 8.5 to 13th magnitude, AX Persei is visible to anyone with an 8-inch telescope, and if it erupts to maximum it will be visible in binoculars. You can monitor this interesting star and report your observations to the American Association of Variable Star Observers (AAVSO). Charts with comparison stars of known brightness can be plotted and printed using the AAVSO's Variable Star Chart Plotter, VSP.

~ By Mike Simonsen ~

~Simonstronomy, <http://simostronomy.blogspot.com>~

2011 Club Meeting Dates . . .

January 13	July 14*
February 10	No meeting in August
March 10	September 8
April 14	October 13
May 12	November 10
June 9	December 8

*Held if a meeting is proposed and favorably voted for by the membership in attendance at the June meeting.

All meetings held at the Phillips Auditorium at the Center for Astrophysics at 60 Garden Street, Cambridge MA. Parking is available on site for the duration of the meeting.

February Star Fields DEADLINE

Noon, Sunday, January 23

**Email articles to the newsletter editor at
newsletter@atmob.org**

Articles from members are always welcome.

POSTMASTER NOTE: First Class Postage

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OBSERVING: Bruce Berger (978)-387-4189

OBSERVING AND PUBLIC OUTREACH

STAR PARTY COORDINATOR:
Virginia Renehan starparty@atmob.org

How to Find Us...

Web Page www.atmob.org

MEETINGS: Held the second Thursday of each month (September to July) at 8:00PM in the Phillips Auditorium, Harvard-Smithsonian Center for Astrophysics, 60 Garden St., Cambridge MA. For INCLEMENT WEATHER CANCELLATION listen to WBZ (1030 AM)

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

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