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The Refractor

The Bulletin of the Eastbay Astronomical Society
Founded in 1924 at Chabot Observatory, Oakland, California

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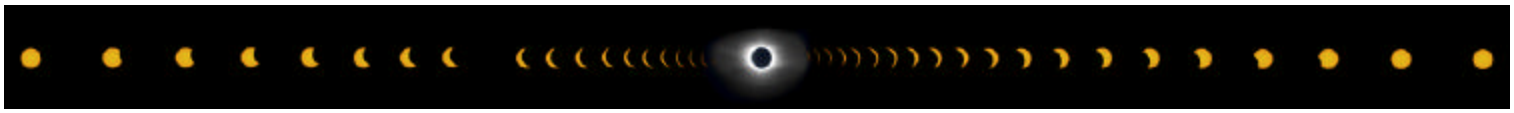
Number 12

Nov. 2009



2009 Total Solar Eclipse sequence by EAS member Robert Minor from the deck of a cruise ship 100 miles east of Iwo Jima.
See Robert's spectacular close-up image on page 2 showing polarization of the corona during totality.

November 2009 EAS Lecture Meeting

Speakers: **Jonathan Pober , UC Berkeley**

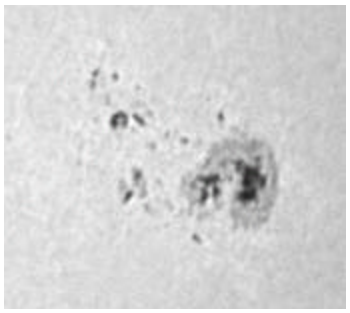
Talk Title: **Fundamental Physics and Cosmology with Low-Frequency Radio Observations**

When: **Saturday, November 7th, 7:30pm**

Where: **Physics Lab, 2nd Floor, Dellums Building, Chabot Space & Science Center**

This talk will review our basic cosmological model of the history of the universe, with particular attention to the period of ultra-rapid expansion in the very early universe called "inflation". Although necessary for our understanding of the universe today, no firm physical basis explains why inflation took place. I will describe how observations with low-frequency radio telescopes hope to one day constrain the physics of inflation. I will also discuss current low-frequency observational work regarding the formation of the first stars and the reionization of the universe.

August first quarter moon by EAS member Bob Schalck, shot with a digital camera handheld at the eyepiece of a 6 inch telescope from North Bend, on the Oregon coast.



Solar activity persists!
White light photo of AR11029 by Jim Ferreira

EAS Officers Elections

Yet, again, it is time to elect new EAS officers. Volunteers are needed for a nominating committee and nominations are sought for EAS President, Vice-President, Secretary and Treasurer. If you'd like to help or have a nomination, contact EAS President Paul Hoy at (510) 814-8325 or by E-mail at ahoy@aol.com

DINNER WITH THE SPEAKER
5:30, Sat, Nov. 7

Contact Paul Hoy
(510) 814-8325
RSVP by Friday

Inside this issue:

Polarization of the Solar Corona, 2009 Total Solar Eclipse by Robert Minor

[Published in the December 2009 issue of Sky & Telescope]

Polarization of the corona: EAS member Robert Minor explains that three sets of images were taken during mid totality, each set through a linear polarizer at a different rotation angle. Each set of images was mapped to a single color, 0 degrees = red, 120 degrees = green, and 240 degrees = blue. The resulting combined color image shows overall radial polarization which Robert points out is consistent with models of electron scattering as the source of the visible light from the corona.

Robert also shot flash spectra images of the beginning and end of totality using a blazed diffraction grating placed between the telescope objective and digital camera. Bright emission lines from the chromosphere along with the background continuous spectrum from the corona are visible in the image at right.

Flash Spectra of second and third contact by Robert Minor

Chabot Space & Science Center Invites EAS Members to Volunteer with Us!

- Share your knowledge of and passion for astronomy with thousands of CSSC visitors
- Experience the unique opportunity to operate Chabot's historical telescopes
- Share your own telescope at Chabot*
- Inspire young astronomers and future scientists by assisting students in our astronomy education programs

Explore these opportunities at our next Volunteer Orientation!
For upcoming orientation dates, or for more information, please contact us at: volunteers@chabotspace.org
or, call our Volunteer Manager Megan Gray at (510) 336-7414

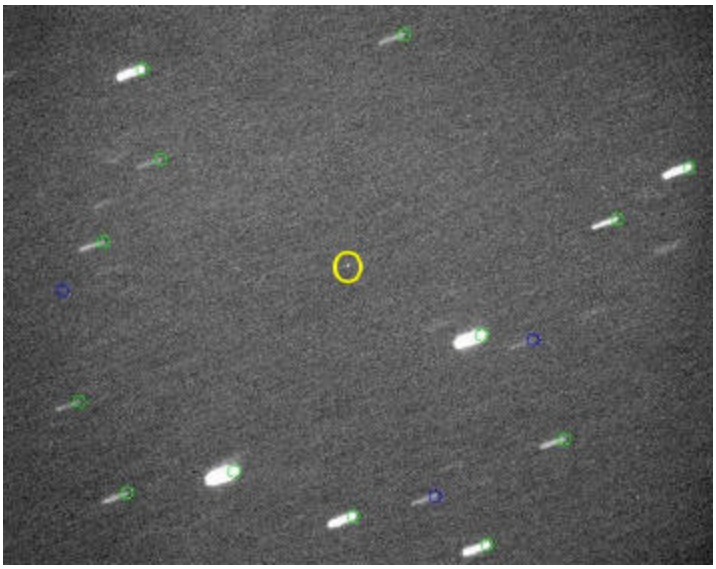
- *EAS members who are only interested in sharing their own telescope at Chabot are required to attend a Chabot volunteer orientation and complete a self-guided training worksheet entitled "Getting to know Chabot." After completion, you may join us on deck and share your own telescope any Friday or Saturday night!*

***Full Chabot Volunteers must make the regular volunteer commitment and pursue official placement through the Volunteer Manager.*

SEARCHING FOR NEO

NEOs, or, Near Earth Objects are solar system objects, asteroids or comets, with orbits that periodically bring them into close proximity with the Earth. Often, uncomfortably 'close proximity.' Known NEOs number in the thousands and are tracked by a network of observatories world wide, coordinated by the Minor Planet Center (MPC) at the Smithsonian Astrophysical Observatory in Massachusetts.

So how close is 'close proximity?' Well, on the morning of March 2, 2009, asteroid DD45 2009 passed by the Earth at a distance of 72,000 kilometers. That's about twice the distance of geostationary communication satellites. DD45 2009, by the way, is a rock the size of a very large house.



Asteroid 2009 SU104: On the date this image, it was moving WNW at 8 arc seconds per minute, and was about 3.3 million miles from Earth. Discovered the day before by the Catalina Sky Survey in Arizona. The image is an example of 'stack & track,' where the stars are streaked and the Asteroid is a single point.

Systematic searches for new asteroids and comets are conducted by fewer than a dozen observatories with specialized wide field survey telescopes. When one of these observatories detects a moving object, it is reported to the Minor Planet Center. The MPC views any moving objects as a potential unknown NEO, so preliminary orbits are calculated and the information is posted on MPC's NEO Confirmation Page website for follow-up observations by other observatories. Over the next two or three nights, observations are made to confirm the object and determine its orbit. Once the MPC has this data, it assigns a provisional designation to the object, and formally publishes the orbital elements via its Minor Planet Electronic Circulars (MPECs).

So, what does all this have to do with EAS or CSSC?

Chabot Space and Science center is part of that world wide network of observatories that gathers follow up data on new objects discovered by the survey telescopes, thanks to the efforts of long time EAS member and Treasurer, Gerald McKeegan.

When Chabot's 36 inch telescope, Nellie, became operational there were plans in the works to use it for systematic NEO work. Unfortunately, changes in CSSC staff and budget issues placed the project on a 'back burner.' This was a major disappointment to Gerald as he has a keen interest in minor planets – his research paper for his Masters degree was on the Kuiper Belt – so he decided to do the project on his own.

Over the next few months, with the help of Conrad Jung, Gerald put together the necessary equipment and developed the required skills to photograph NEOs with Nellie. First order of business was to acquire a IAU observatory code from MPC. Asteroid, comet, supernova and other official astronomical data submissions must include a code which uniquely identifies the reporting observatory, and cross references to a master IAU database that identifies the exact configuration and location of the observatory.

To obtain the observatory code, Gerald had to submit accurate observation data for two or more known asteroids, taken over a series of several nights. Gerald admits it took some practice to attain the required accuracy, but by early summer 2008 he had obtained the observatory code.

Initially, imaging was done with DSLR cameras, but the cameras were not sensitive enough to adequately record faint, rapidly moving NEOs. So Gerald purchased a more sensitive monochrome CCD camera, which has worked out quite well.

No filters are used when imaging faint asteroids as he wants every available photon to hit the CCD chip. Using a focal reducer with the camera gives him a 11.5 arc minute field of view with Nellie.

Each evening of observing begins with checking the MPC NEO Confirmation page for suitable targets. For each target, Gerald downloads an ephemeris table that gives time and coordinates for that night. He points out that coordinates can be off as much as several arc minutes.

If the target asteroid is expected to be moving slowly, less than 0.5 arc seconds per minute, he'll plan to shoot three single images with a period of 15 or 20 minutes between images. Exposure time for these slow movers can range from 30 seconds for an 18th magnitude asteroid to 3 minutes for those around 21st magnitude. So far, the faintest asteroid imaged with Nallie had a visual magnitude of 21.8.

Most newly discovered NEOs are moving much faster than 0.5 arc seconds per minute; in fact those very close to the Earth can be moving more than 30 arc seconds per minute. For fast movers a different imaging technique must be used. Instead of three images with long intervals between them, he shoots short exposure images in rapid succession for a period of 10 to 15 minutes, producing 50 to 100 images.

When working with the images of slow mover asteroids, Gerald will align the images, then 'blink' compare the images looking for moving objects. For the fast movers, he uses a different technique called 'stack & track.' Software stacks the images based on the expected movement of the asteroid rather than by aligning the stars. This results in an image where all the stars are streaks, but the asteroid is a single point.

Finally, he then carefully determines precise coordinates of each target asteroid from his images, recording time and other pertinent data, and submits it all electronically directly to the Minor Planet Center.

The biggest challenge to doing asteroid work on Nellie, according to Gerald, is Nellie's location. The weather, especially in the summer, can make it very difficult to schedule an observing session. Fog or high humidity frequently make it impossible to do a session. Even when the weather cooperates, smog and light pollution restrict both atmospheric transparency and seeing. This is especially so when trying to observe to the south or west at lower elevations

When asked if Gerald has had any unexpected finds, he says the strangest was an empty Centaur rocket upper stage, launched in 1996. The rocket section is in a highly elliptical orbit around the Earth, and he happened to catch it during a NEO imaging session. Because it was at apogee at the time, it was 38,000 miles away and moving slowly enough to appear to be another NEO. He reported his observations to the MPC, and initially they couldn't match the observations to any known asteroid, so they posted it on the NEO Confirmation Page. However, they later were able to match it to NORAD data on the old Centaur rocket……no new asteroid.

To date, Gerald has submitted data on 149 NEOs...and a Centaur Rocket. You can see the data on the NEO Dynamic Site at:

http://newton.dm.unipi.it/neodys/index.php?pc=2.1.2&o=G58&ab=0

If you would like to learn more about searching for NEOs, contact Gerald McKeegan at:

geraldspace@earlink.net

Gerald's NEO project is an outstanding example of a serious amateur astronomer contributing, in a very significant way, to a long term, international, professional observing campaign.

Congratulations, Gerald! Well done.

EAS / CSSC Outreach

November 19th there will be a star party at the King middle school in Berkeley. EAS members with portable scopes are sought to help out. For more information contact Paul Hoy at 510-814-8325.

Gassendi by Jim Ferreira

EAS Annual Dues

The EAS annual membership year ended on October 31st. If you have not already done so, please take a moment to renew your membership soon. You can renew on-line at:

http://www.eastbayastro.org/index/application-1.htm

...or you can renew by mail by using the attached form or by downloading the form at:

http://www.eastbayastro.org/join_eas.htm

A couple of important points to remember:

1. If you already receive Sky & Telescope through a club subscription, do NOT renew using the EAS form. Instead, renew your S&T subscription directly with the publishers, using the renewal form they send you. Once you have an initial club member's subscription, S&T will use the club rate on the renewal form they send you. You may continue to renew your Astronomy magazine subscription through the club.
2. If you joined EAS after July 1st of 2009, your membership is already good until the end of October, 2010. You do not need to renew now. If you are not sure if you are in this category, send me an e-mail and I'll let you know.

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Gerald McKeegan
Treasurer, Eastbay Astronomical Society
Home: (925) 926-0853
Cell: (925) 899-3468 (voice only)
E-mail: geraldspace@earthlink.net

EAS Loaner Scope Program has telescopes available for rental by EAS members. Scopes include 60mm and 80mm refractors, a C-90, two 10 inch Dobsonians, and ; 4, 8 and 11 inch Schmidt-Cassegrains. Scope rental is $15 a month, with a $50 deposit. For information, contact Ray Wong at (510) 796-8475 or qm7@yahoo.com

EAS Library: Hours, 3:00pm - 7:00pm every Friday, and immediately after monthly EAS lecture meetings. The library is located on the second floor of the Dellums Building, down the hall next to the interactive lunar lander exhibit.

Volunteer librarians are needed to expand library hours. If you'd like to help contact Paul Hoy at (510) 814-8325 or by E-mail at ahoy@aol.com

The Year In Space

The Year In Space print edition desk calendar is published in cooperation with The Planetary Society. A free online / e-mail version is now being offered.

Now in its 17th year of publication, The Year In Space features images and information from the past, present and future of space exploration and astronomical discovery. Each weekly space photo-essay is accompanied by daily Moon phases, night sky information, space history dates, and more.

See the current week in space online:
http://www.yearinspace.com/the-week-in-space

Sign up for the free weekly newsletter:
http://www.yearinspace.com/weekly-e-mail

Learn about the 144-page desk calendar:
http://www.yearinspace.com/desk-calendar

Prez' on the move!

No, not our Prez' in the white-top helicopter, but our very own EAS president, Paul Hoy, recently moved and now has a new land-line telephone number:

(510) 814-8325

FUTURE CONJUNCTIONS—2009

Nov	7	EAS General Meeting, Chabot, Physics Lab, 7:30pm
	12	Board Meeting, Chabot, Soda Board Rm, 7:30pm
	30	EAS MOVN*, 7pm-10pm, Wightman Plaza, Chabot
Dec		TBA - EAS General Meeting
	10	Board Meeting, Chabot, Soda Board Rm, 7:30pm
	27	EAS MOVN*, 7pm-10pm, Wightman Plaza, Chabot

*Please call Gerald McKeegan at (925) 926-0853 after 5pm on the date of the MOVN to verify that it has not been cancelled due to weather or other considerations.

Eastbay Astronomical Society

At Chabot Space & Science Center
10000 Skyline Boulevard ● Oakland, CA 94619

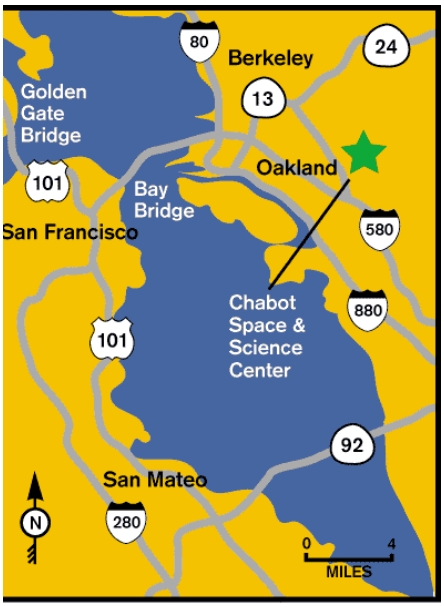
November 2009

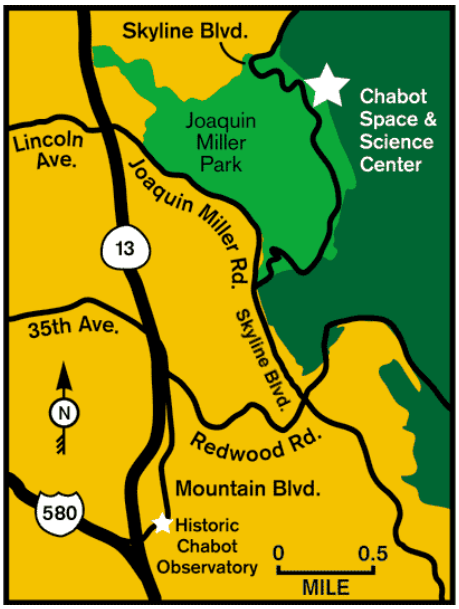
RETURN SERVICE REQUESTED

Eastbay Astronomical Society

President: Paul Hoy (510) 814-8325 ahoy@aol.com
Vice President: Alan Fisher
Treas: Gerald McKeegan (925) 926-0853 geraldspace@earthlink.net
Membership Reg: Bruce Skelly EastbayAstro@gmail.com
Secretary: Linda Lazzaretti (510) 633-2488
Events Coord: Dave Rodrigues (510) 483-9191

Articles and photos for ***The Refractor*** are encouraged. Deadline for the Dec. 2009 issue is Nov., 20 2009. Items may be submitted by mail or E-mail to: Interim Editor - Jim Ferreira, 753 Oriole Avenue, Livermore CA 94551 bakerst@comcast.net (925) 449-0107





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***Always call to confirm**

Join the Eastbay Astronomical Society

❑ Regular, $24/year ❑ Family, $36/year
❑ Contributing, $40/year ❑ Student, $15/year (digital news-
❑ Sustaining, $60/year or more letter, only)

Contact: Gerald McKeegan, EAS Treasurer
Telephone: (925) 926-0853 Email: geraldspace@earthlink.net
Mail: 1760 1st Ave, Walnut Creek, CA 94597-2561
Sign up online at http://www.eastbayastro.org/

EASTBAY ASTRONOMICAL SOCIETY MEMBERSHIP APPLICATION FORM
[_] New [_] Renewal *(Just print this page, fill it out, and mail it in!)*

NAME: (please print)_____

ADDRESS:_____

CITY, STATE, ZIP_____

DAY PHONE: (____)_____

EVE PHONE: (____)_____

EMAIL ADDRESS: (please print very legibly!) _____

MEMBERSHIP CATEGORIES:
[_] Regular $24 [_] Family $36 [_] Contributing $40
[_] Sustaining $60 or more $_____ [_] Student $10 (digital newsletter only)

Optional discounted 12-month magazine subscriptions:
[_] Sky & Telescope $32.95 [_] Astronomy $34.00 *(Both magazines may only be ordered between the months of July and December) (If you are renewing your S&T club subscription, please use the renewal notice sent to you by S&T.)*

[_] Optional, tax deductible donation(s) to any of the projects of the Eastbay Astronomical Society:
Burns Library $_____ Betty Neall Youth Award Fund $_____General $_____Other:_____ $_____

[_] EAS Lapel Pin $3.00 +$1.00 per pin for shipping and handling. # of pins_____ Total Amount for # of pins $_____
(Tip: If you buy them at a club meeting or event, you can avoid the S&H fee.)

Total Enclosed: $_____

Please mail this form and your check or money order payable to: Eastbay Astronomical Society , PO Box 18635, Oakland, CA 94619-0635

For more information, please contact club Treasurer Gerald McKeegan at (925) 926-0853, geraldspace@earthlink.net, or write him at above address.

By default, (if you have an email address) you will be notified by email that the digital (.pdf) version of the club newsletter is ready to download off the club website. If you prefer to get the B&W hard copy, please check the box below:

[_] I prefer the hard copy mailed to the address entered above.
[_] Are you interested in volunteering your time/equipment for public stargazing at Chabot?
[_] Are you interested in doing other volunteer work for Chabot and/or the Eastbay Astronomical Society?

THANK YOU FOR JOINING US!