



# The Refractor

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

Volume 87  
 Number 07

May 2011

## May EAS Lecture Meeting

**Title: Celebrating One Neptunian Year:  
 What We've Learned, What Surprised Us,  
 and What's Next for the Eighth Planet**

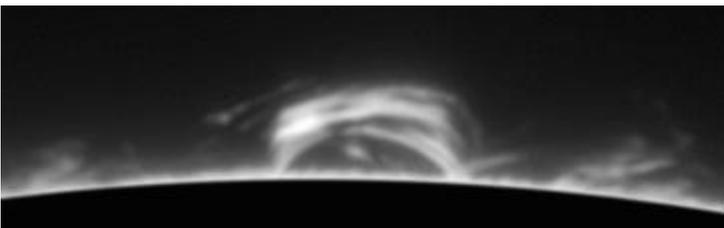
**Speaker: Statia Luszcz-Cook, PhD candidate,  
 Astronomy Department, UC Berkeley**

When: Saturday, May 14th, 7:30pm

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

In July 2011, Neptune will finally complete its first orbital rotation since its discovery in 1846. This long year is a consequence of its distance from the Sun - more than 30 times greater than that of Earth. As a result, Neptune receives very little solar energy to power its atmosphere. Remarkably, when Voyager II flew by Neptune in 1989, it revealed that Neptune has perhaps the most dynamic atmosphere in our Solar System, with 900 mph winds and dynamically active methane clouds as large as several thousand miles across.

A second consequence of Neptune's location in the far reaches of the Solar System is that it is incredibly difficult to study. Currently, Neptune is one of only two planets in our Solar System not targeted by recent or ongoing space programs. From the ground, Neptune is invisible to the naked eye, and the details of its atmosphere remain unresolved with traditional ground-based telescopes. In this talk, we will discuss some of the ways scientists have overcome the challenges of study-



### Solar Prominences at Chabot!

Live video viewing of the sun in H-alpha & CaK light on the observing deck, every sunny Weekend. Flare-loop photo by Jim Ferreira

ing such a faraway planet. We will look at several of the great discoveries and big surprises of the Voyager II visit to Neptune, and at the technological advances of the past two decades that allow us to continue studying Neptune's atmosphere from the ground. I will describe recent observations from the Keck telescope in Hawai'i that help us understand Neptune's cloud activity and large-scale atmospheric circulation. I will also present observations from the CARMA interferometer in eastern California, which let us look deeper into the atmosphere and teach us about Neptune's chemistry and environment. Finally, we will discuss future prospects for research into the behavior of Neptune's atmosphere, both from the ground and from space.

Statia Luszcz-Cook is a PhD candidate in the Astronomy Department at UC Berkeley. As an undergraduate at Cornell University, she worked on measuring the day and night temperatures of extrasolar planets using light curves from the Spitzer Space Telescope. Her current research focuses on understanding Neptune's atmospheric dynamics through ground-based observations. An experienced observer, with more than 40 days observing at CARMA, a millimeter array in Eastern California, as well as several nights on the 10-m Keck II telescope on Mauna Kea, Hawaii. She is an active volunteer with Oakland Animal Services and CSSC, and enjoys cooking, ballet, and hiking around the bay area with her husband, Jonathan and their dog, Charlie.



#### DINNER WITH THE SPEAKER

5:30, Sat, May 14

**Hunan Yuan**

4100 Redwood Rd.

(next to Safeway)

No need to confirm,

Just show up!

#### Inside this issue:

- |                                |        |
|--------------------------------|--------|
| -Hands On Deck                 | page 2 |
| -Nellie : Focal Length vs. ADU | page 3 |
| -GONG : Good Vibrations        | page 4 |



**WANTED: PHOTOS OF OLD CHABOT**

Do you have photographs of the Mountain Boulevard Chabot Observatory? If you do, pick out the best of the best and send a scanned image to the Newsletter editor. A new image will be posted in the newsletter each month.

**FUTURE CONJUNCTIONS—2011**

- May 14 General Meeting, Chabot, Physics Lab, 7:30pm
- 12 Board Meeting, Chabot, Soda Room, 7:30pm
- 8 EAS MOVN, 7pm-10pm, Wightman Plaza
- Jun 11 General Meeting, Chabot, Physics Lab, 7:30pm
- 9 Board Meeting, Chabot, Soda Room, 7:30pm
- 5 EAS MOVN, 7pm-10pm, Wightman Plaza

For questions or if you are uncertain about the weather, call (925)926-0853 before 6pm, or check Chabot's weather page at <http://www.chabotspace.org/forms/weather.aspx>

**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 and 8 inch Schmidt-Cassegrains. Scope rental is \$15 a month, with a \$50 deposit. For information, contact Ray Wong by E-mail at [qm7@yahoo.com](mailto: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. **We are particularly interested in any member having experience with book cataloging software.** If you'd like to help contact EAS president Barry Leska at [b.leska@comcast.net](mailto:b.leska@comcast.net)

**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 And find out about our next Volunteer Orientation!**

<http://www.chabotspace.org/adult-volunteers.htm>

*\*EAS members who are only interested in sharing their own telescope at Chabot (not a full volunteer commitment) are required to attend a volunteer orientation. After completion, you may join us on deck and share your own telescope any Friday or Saturday night! Chabot Volunteers must make the regular volunteer commitment and pursue official placement through the Volunteer Manager.*

**Subject: Nellie Focal Length vs. ADU - New Spacers  
[equipment status update by Gerald McKeegan]**

**SHORT VERSION:** Optimum focal length for Nellie of 7,320mm is now achieved with ADU setting of 2435, which is a mid-range setting, as desired.

AD'what?

Gerald: ADU means "analog to digital units." When an electronic system converts an analog signal (in this case the linear potentiometer on the secondary mirror drive) to a digital value that is displayed as discreet integer numbers, the digital readout is in ADUs. Nellie's control system depicts the position of the secondary using a four digit numerical display on the computer screen.

**LONG VERSION:**

Earlier this month, Kevin Medlock (read crazed telescope maker extraordinaire) replaced the spacers on Nellie's secondary spider, with the intent of allowing much more range of motion for the secondary, with respect to the optimum mirror separation position. Previously, Gene Cross had determined that the optimum mirror separation would yield an effective focal length of 7,320mm. However, in order to place the secondary at the optimum position, the secondary had to be moved to an ADU setting of 3380, which was very close to the maximum "out" setting of 3400. This was not desirable, so Kevin shortened the spacers (by 0.45") in an effort improve the situation.

Last night (April 21) the weather cleared just enough to do some Focal Length vs ADU tests on Nellie with the new spacers in place. Although the humidity was high (85-90%) and the transparency only marginal, the air was fairly steady and the seeing was good. I mounted my ST-8XME camera on the A-P (Astro-Physics) focuser using Nellie's 2.7" to 2" adapter. I determined the focal length at ADU settings of 2000 to 3000, at 200 ADU intervals.

All testing was done with the telescope pointed at RA: 12h 22m 20s, Dec: +26° 59' 08". This position was near the zenith, and provided a field of approximately 16 usable reference stars from the new PPMXL star catalog.

For each test, I moved the secondary using the hand-paddle buttons until the desired ADU setting was achieved. I then used the A-P focuser to adjust the camera position until image focus was achieved. I did this by taking repeated 5 second exposures while adjusting the rack-&-pinion focuser until stars in the field appeared sharpest and the maximum pixel intensity was achieved. This is

somewhat subjective since the exact point of best sharpness is difficult to determine visually, and the maximum pixel intensity normally varies slightly from one image to the next. So it is possible that the focus points I settled on were off slightly, but by no more than 1 or 2 mm (in two cases, after evaluating the test images I shot, I was pretty sure I was slightly off on the focus, because it appeared soft).

The A-P focuser is not capable of extending far enough to focus the camera at focal lengths greater than 7330 mm. So, as I increased the ADU settings, I eventually had to put a 2" extension tube between the focuser and the camera. All images with ADU settings of 2600 or more were taken using the extension tube.

Once I had the camera focused for a given ADU position, I shot four images using 25 second exposures for each. I used the Astrometrica software plate solving routine to determine the actual focal length for each image.

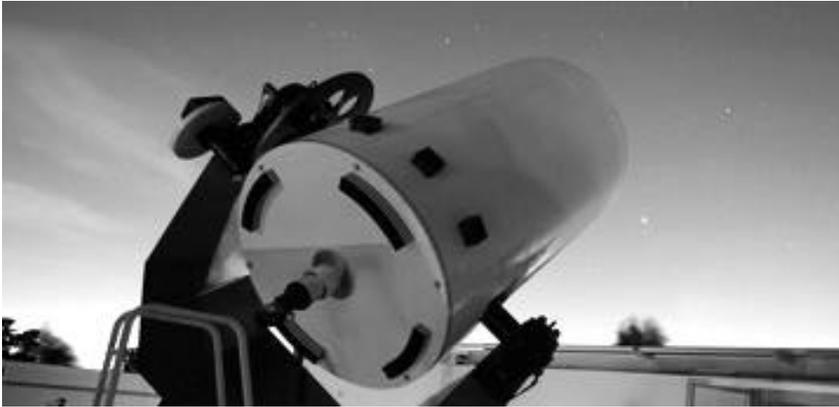
The software requires the user to enter the camera parameters, telescope pointing, and a preliminary "guess" of the focal length (I used 7,300mm). The software extracts appropriate reference stars from the PPMXL catalog and matches them to the stars in the image. It then determines the actual image scale and the effective focal length. It is normal for focal length to vary slightly due to changes in atmosphere conditions, temperature, wind, etc. So once I found the focal length of each individual image, I calculated the average of the four.

...by the way: PPMXL is a catalog of positions, proper motions, 2MASS- and optical photometry of 900 million stars and galaxies, down to about V=20 full-sky. It is the result of a re-reduction of USNO-B1 together with 2MASS to the ICRS as represented by PPMX. ....maybe that didn't help. [ed.]

Results of the testing are shown in the attached PDF file [file not attached to newsletter]. The average focal lengths versus ADU setting are plotted. The resulting linear regression analysis shows a slope of 0.11539 with a y-intercept of 7039.

Using those numbers, the computed ADU setting that gives the ideal focal length of 7,320mm is 2435. This is very close to the center of the allowable ADU adjustment range (center = 2342). Moving the secondary to the 2435 ADU setting gives the best mirror spacing, and allows

[continue page 4: Nellie]



[Nellie: continue]

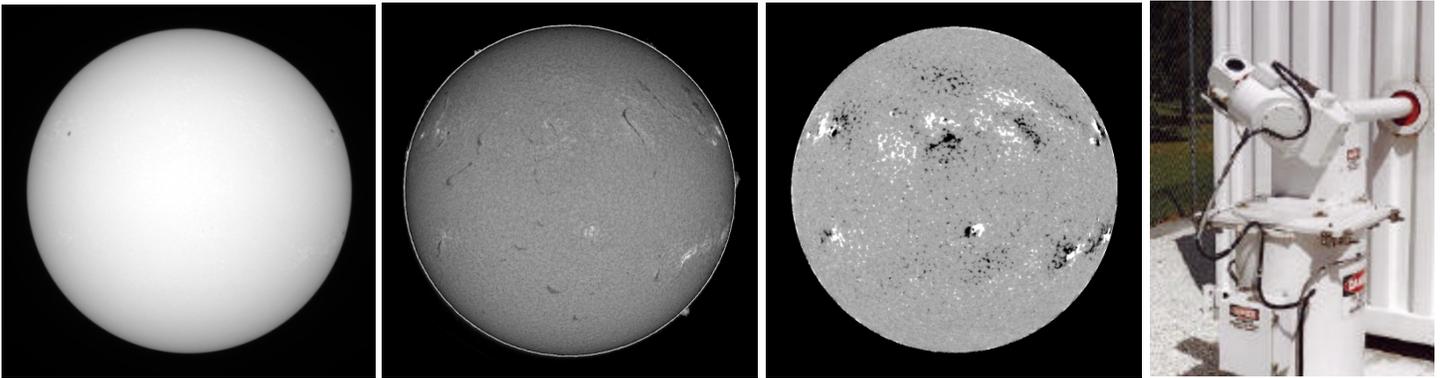
plenty of adjustment in either direction.

However, as Gene has stressed several times, excessive movement of the secondary should be avoided. Changing focal length by more than about  $\pm 15$  mm from optimum will introduce spherical aberration. This same caution is emphasized in several papers and online publications that I've read in the last few weeks. So we should put the secondary at 2435 ADU, and adjust/cut everything else to allow us to stay at that point or no more than  $\pm 130$  ADUs from there.

As I got to the end of my test run last night, the humidity had reached 90%, so I shut down the telescope. Unfortunately, I did not get a chance to measure the backplate-to-focal plane distance at the 2435 ADU position. I will have to do that on another night, when the weather cooperates. Based on previous work, my guess is that the Apo-

gee tube will have to be cut approximately 5/8-inch shorter in order to match it to the optimum secondary position. If you elect not to cut the tube, you still will be able to bring it to focus with the current configuration, but there will be some spherical aberration.

[Editor's note: So why post so technically complex a report to the EAS general membership when the short version would suffice? The answer is simple, so the EAS general membership will see the kind of work regularly being done in the background by a handful of dedicated, technically talented EAS and CSSC volunteers. Each month a couple dozen or more volunteer man-hours go into maintaining the telescopes and support equipment in the domes and on the observing deck so it will be fully operational for public programs and our EAS MOVN nights. Just thought you should know.]



### **Global Oscillation Network Group - GONG National Solar Observatory**

The Global Oscillation Network Group (GONG) is a 6 station, multi-national program conducting continuous studies of the Sun's internal structure using helioseismology. The six instruments located around the Earth observe the sun continuously, recording and measuring the Sun's natural "5-minute" oscillation, or pulsations.

Helioseismology utilizes waves that propagate throughout the Sun to measure, for the first time, the invisible internal structure of the Sun. There are millions of distinct, resonating, sound waves, seen by the doppler shifting of light emitted at the Sun's surface. The periods of these waves depend on their propagation speeds and the depths of their resonant cavities, and the large number of resonant modes, with different cavities, which allows GONG astronomers to construct extremely narrow probes of the temperature, chemical composition, and motions from just below the

surface down to the very core of the Sun.

Of particular interest to the amateur solar observer is the GONG web site, a treasure trove of 'real-time' solar activity. Every 60 seconds the web site updates hydrogen-alpha full disk images, white-light full disk images and full disk magnetograms, plus streaming time-lapse. Also regularly updated are synoptic magnetograms and images of the far side of the sun reduced from ongoing seismic measurements.

Each of the 6-stations are equipped with a very robust alt-azimuth, 28mm aperture telescope utilizing a hybrid interference filter system and Michelson interferometer. Both telescope control and data acquisition are fully automated, backed by 2 computers and precision clock, and housed in a portable cargo container.

To learn more visit the GONG website at:

**<http://gong.nso.edu/>**



# Eastbay Astronomical Society

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

**May 2011**  
*RETURN SERVICE REQUESTED*

## Eastbay Astronomical Society

President: Barry Leska b.leska@comcast.net

Treas: Richard Ozer (510) 532-5477 rozer@pacbell.net

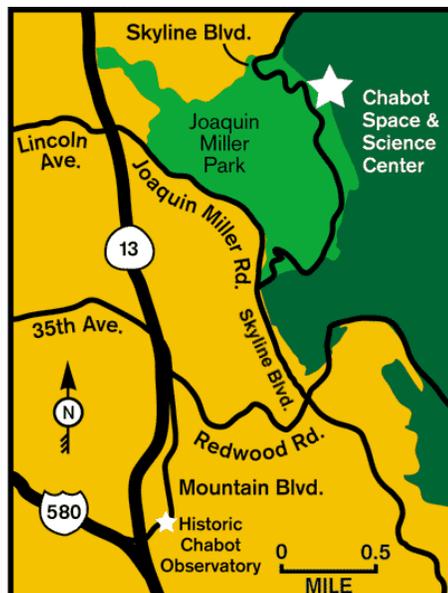
Secretary: Linda Lazzaretti (510) 633-2488

Articles and photos for *The Refractor* are encouraged. Deadline for the May, 2011 issue is May 1, 2011. Items may be submitted by snail-mail or E-mail to: Editor - Jim Ferreira, 753 Oriole Avenue, Livermore CA 94551 bakerst@comcast.net (925) 449-0107

Vice President: Paul Hoy ahoy@aol.com

Membership Reg: Bruce Skelly EastbayAstro@gmail.com

Events Coord: Gene Weber (925) 963-1165 gene.weber@gmail.com



### FUTURE CONJUNCTIONS

- May 14** General Meeting, Chabot, Physics Lab, 7:30pm  
**12** Board Meeting, Chabot, Soda Room, 7:30pm  
**8** EAS MOVN, 7pm-10pm, Wightman Plaza  
**June 11** General Meeting, Chabot, Physics Lab, 7:30pm  
**9** Board Meeting, Chabot, Soda Room, 7:30pm  
**5** EAS MOVN, 7pm-10pm, Wightman Plaza

### Join the Eastbay Astronomical Society

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

Contact: Richard Ozer, EAS Treasurer  
Phone: (510) 532-5477 Email: rozer@pacbell.net

Sign up online at <http://www.eastbayastro.org/>