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The Refractor

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

Volume 82
Number 1
November 2005

November 2005 talk:

Tricolor Narrowband Imaging of Nebulae

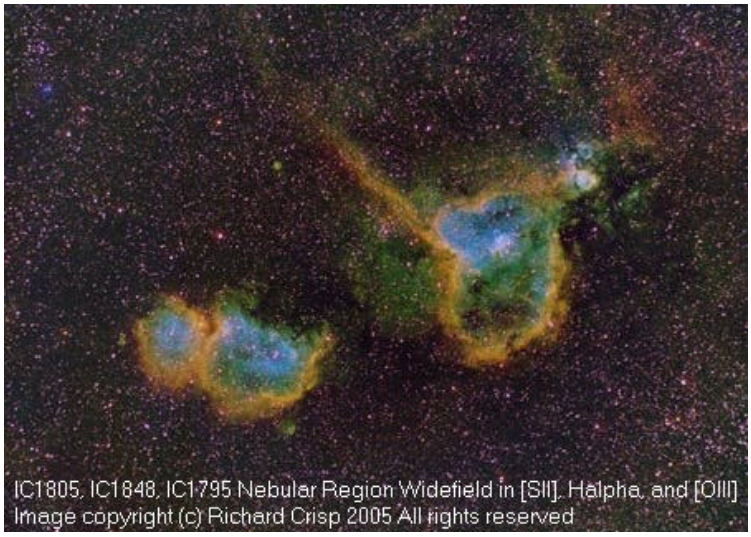
Saturday, November 19, 2005, 7:30 pm
Speaker: Richard Crisp, Electrical Engineer

Chabot Space & Science Center
Physics Lab, 2nd Floor, Spees Building

Did you ever wonder why the images from the Hubble Space Telescope, such as the Eagle Nebula, have such an unusual color and appearance? It is because the images were taken using emission line filters instead of the better-known red, green, and blue filters. Once limited to professionals and researchers, such filters are now growing in popularity in the amateur astro-imaging community offering both relief from light pollution's effects as well as giving a fresh and new appearance to familiar nebulae.

This talk discusses the work I have done in this area over the past two and a half years, starting with a brief review of the science of nebular emission and the historical background of key discoveries relating to their physical mechanisms, and then focuses on a collection of narrowband images, both monochrome and tricolor, taken using the techniques I have developed. It concludes with a brief discussion of the equipment used.

Richard Crisp is an electrical engineer living in the East Bay working in the heart of Silicon Valley. After spending nearly 25 years in the go-go world of integrated circuit design and development, he took a short break from the industry taking up astronomical imaging as a hobby at the end of 2000. In the five years he has been shooting astro-images, he has had many of his images published in books, magazines, and the NASA Astronomy Picture of the Day website. He has also written an article on the techniques he has developed for narrowband imaging that appeared in the August 2005 issue of "Sky and Telescope". Mr Crisp also builds much of his imaging equipment when necessary, citing a lack of suitable hardware being available off the shelf. ★



IC1805, IC1848, IC1795 Nebular Region Widefield in [SII], Halpha, and [OIII]

Historic moment for Chabot Space & Science Center
Dr. Stephen Hawking, in the Bay Area for two speaking engagements, came to see Chabot's new, and now vastly upgraded, all-dome planetarium projection system. Asst Pgms Dir Ryan Diduck, and Director Alex Barnett, pose with Dr. Hawking in front of the Einstein telescope.

DINNER WITH THE SPEAKER
5:30 pm
Saturday, November 19
HUNAN YUAN
4100 Redwood Rd., #11
(next to Safeway)
Oakland
(510) 531-1415
No need to confirm—just show up!

Inside This Issue:

THE MEAD DSI PRO - THE ASTROPHOTOGRAPHERS' DREAM CAMERA

By Terry Galloway, PhD., and Helen Chou

The Mead DSI Pro is a CCD camera with the ability to select images according to the highest quality and reject the others, then align them so they overlap perfectly and then stack the best ones to get a near-perfect combined image. The really significant advantage is that the individual exposures are extremely short, like 30 to 45 milliseconds, so they are not significantly spoiled by atmospheric turbulence. In this way, the full image is built up short image by short image to reach a 1/2 second or more total exposure. By comparison, if you take one 1/2 second exposure, the atmosphere blurs the image and it is usually quite fuzzy. With film cameras, we used to take very many 1/2 second exposures and hope that one may just be a little less blurred. Nowadays, with computer controlled CCD cameras, astronomical images can be obtained that are better than the huge telescopes used to do some 20 years ago. And the techniques will continue to get better and better.

Chabot is on the front of this wave moving forward. As you can see from the Mars image, it is really pretty exciting! The CCD camera technology is a leap forward. In a CCD camera, every single photon is counted and stored. Unlike film where very low light does not have enough threshold energy to activate a silver grain, CCDs do not have a threshold. Really interesting! The 1/2 second exposure time is used because 1/2 second happens to be the total exposure needed to get an image which did not saturate the CCD. A saturated CCD will spoil the contrast balance. Consequently, we do not saturate the CCD when we measure magnitude change. We did 2 and 3 minute exposures for our M51 supernova for measuring its magnitude change because the supernova was so dim. CCDs are really quite different from film, but still have special demands (e.g., having to do a dark field exposure to subtract out the electronic noise and random cosmic ray hits; also, a flat field needs to be done as well, consisting of an exposure of a totally white card so the non-linearities can be recorded and subtracted.) We do a dark field exposure to record the electronic noise and random cosmic ray hits; we do a totally white card exposure to record the non-linearities. The dark field exposure and the white card exposure elements are subtracted to create a noise-free flat field image. Our ExoPlanet group has had to learn as much as we could from the *Handbook on Astronomical Image Processing* (by Berry and Burnell, 2005) and then even more by trying and making mistakes and trying again. Interesting!

The picture of Mars (opposite - right side) was taken by Chabot volunteers with the Mead DSI Pro CCD camera through Rachel, Chabot Space & Science Center's 20" refractor telescope. If you want to know how a Charged-Coupled Device camera works, check out http://www.ghg.net/akelly/ccdbasic.htm

Professor Claire Chapin, from Merritt College's Astronomy and Physics Dept., a member of the ExoPlanet team using the CCD camera we employ for measuring the light curve of an exoplanet's transit across the stars face. At the lower part of the camera, the waffle patterned back contains the CCD chip, which very sensitively records light from the star. This waffle pattern back helps keep the CCD chip cool. Just above this is the filter slide which places any one of the standard astronomical photometric filters, B, V, R, and I. Just above this is the flip mirror which has a tremendous magnification and allows us to center the dim object in the field so its light curve can be measured. It flips between the high-powered eyepiece and the CCD. Just above that is the special mount fabricated by our ExoPlanet group which close-coupled to the large diameter bayonet mount that was built into the original telescope and allows for large pieces of equipment to be mounted on and used by the 20" refractor. This mount has within it a special large diameter lens that reduces the effective focal length of the telescope down from it prime focus of f/16.7 to f/8. This wider field helps make comparisons between the target star and nearby photometrically known stars."

Chabot's ExoPlanet Group has been measuring the decay of a supernova explosion in M51, the orbiting of stellar accretion disks, in addition to the long list of ExoPlanet candidates. The most recent has been the newly discovered ExoPlanet in the constellation of Vulpecula. ★

Oregon Star Party

by Jane Houston Jones

This has been a good summer for us, star party-wise. The Grand Canyon Star Party was grand in June. http://www.otastro.org/2005-06-Grand Canyon/ Glacier Point in California's Yosemite National Park was breath-taking in both July and August. http://www.otastro.org/2005-07-sfaa-Yosemite/ And this past week we made our first 1,000-mile trek from Southern California to the Oregon Star Party. http://www.oregonstarparty.org/

I haven't quite come back down to Earth yet since our return from the beautiful high desert and pristine skies of Central Oregon. Pristine, when not combined with earthly atmospheric nuisances such as rain or forest fires. Both were politely refused admittance at the OSP registration tent this year. Clouds were a minor nuisance during some parts of some nights, but didn't hinder my observing too much.

Many people commented on the great number of meteors they saw on the night of September 1 and 2. There were no major meteor showers this month. September's rates are poor in comparison to August's mighty Perseids. So what was going on?

Some meteors I noticed came from the direction of the Anthelion Radiant - think anti-helion or opposite the sun direction. Unlike most of the annual showers the antihelion source is produced by debris from unknown objects orbiting in a direct motion like the earth. These objects are most likely asteroids, which produce stony and metallic debris whose density is much greater than material produced by comets. There is also the possibility that some of this activity may be caused by the Jupiter family of comets, comets which have been altered by Jupiter's gravity into much shorter orbits.

Camped next to us: two comet discoverers, Doug Berger (l) and Don Machholz (r)

This material collides with the earth on the inbound portion of its orbit, before its closest approach to the sun. We see the meteors just after midnight when we are facing the direction from which this activity appears. The antihelion source is active all year from an area of the sky nearly opposite that of the sun. The meteors are actually moving slightly faster than our planet and enter the atmosphere after they have caught up to Earth. Want more information on the anthelion radiant?? http://comets.amsmeteors.org/meteors/anthelion.html

The sporadic rates for the northern hemisphere rise toward their high plateau for the year in September. The numbers of sporadic meteors vary from season to season, due to the tilt of the Earth on its axis and other factors. As a general rule, about 2 to 3 times as many sporadic meteors can be seen in the early fall as can be seen in the early spring. So this explains the greater number of meteors this time of year - the dark skies helped, too.

On the second night, September 2 and 3 I was busy looking at objects from my current project, the Astronomical League's Observe Galaxy Groups and Clusters, while waiting for Mars to rise higher in the morning sky. I noticed many of these faint clusters of galaxies were eluding me after a while. Was I just tired? What was going on? To the north, I noticed a light dome, except there are no earthly sources of this much pollution nearby. Then it dawned on me. I was facing north, looking towards Ursa Major and Ursa Minor. I was looking at airglow, a faint diffuse illumination of the night sky originating in the upper atmosphere.

Airglow is more subtle than an aurora. The energy in the form of visible light is derived from the sun's ultraviolet light, which ionizes atoms and dissociates molecules at heights between 40 and 200 mi (64-322 km) above the earth's surface. When the fragments collide and recombine, some atoms and molecules are left with excess energy, which they release as light. Well, that would explain it - I was seeing airglow. Suddenly I wasn't so annoyed. In fact, it was an exciting observation. It was time to look at Mars anyway.

We spent quite a bit of time observing Mars on both nights, and lots of the other attendees stopped by for a 400x look at the red planet. We had our f/9 Astro-Physics 180EDT refractor, and I think it was the only AP 7-inch refractor in a vast sea of fine telescopes of all sizes. The seeing and transparency were so outstanding on the first night that we were able to view Mars at over 800x with rock steady images near the end of astronomical twilight. The early evening was cloudy and many slept through this best of the three nights. We took a nap until 2 a.m. hoping for the skies to clear, which they did, leaving us with 3 perfect hours.

We had a few visitors who stopped for a look, and stayed with us for more than an hour each night. One of our guests sat in our comfortable observing chair, asked questions and scanned the Milky Way using my 10 x 50 Carton Alderblick binoculars, while I was sketching Mars. She spotted the beehive cluster, M44 below Saturn!

Finally near dawn, another glow appeared. A triangular glow of light extended up about 35 degrees from the horizon past Saturn and on to Mars. Sunlight bounced off grains of dust in the plane of our Solar System, starting at the horizon and lighting the ecliptic plane. The zodiacal light!

Jupiter and Venus graced the sunset sky at dusk. The zodiacal light plus Mars and Saturn welcomed the approaching dawn. What a great star party experience. ★

You may have noticed the Night Sky logo on our website, or seen a demonstration at a meeting. You may be wondering, "What is this Night Sky Network?"

The Night Sky Network is sponsored by NASA and administered by the Astronomical Society of the Pacific. It is made up of a coalition of approximately 200 Astronomy clubs from across the nation in order to provide information about Astronomy and science, and NASA's missions to support these endeavors as a part of the clubs outreach activities.

To do this we are provided kits with activities which help our club educate the public (and our club members). So, what subjects do these kits cover?

There is currently three different kits, with a fourth (which we helped beta test) just about to be released. Each kit covers a different subject area of astronomy, and has a number of activities in support of the subject matter. Here is the listing of the kits currently available:

Planet Quest – Covering questions and information about the search for planets in other solar systems (Extra Solar Planets). This is of special interest to several members of EAS, as we have our own group that is using Chabot's telescopes to explore this exciting new science. Activities include:

- Telescope Treasure Hunt
- Where are the planets we have found?
- Why do we put telescopes in space?
- How do we find Extra Solar Planets?

Our Galaxy Our Universe – These activities help the public understand the size and distance to objects in our universe. Activities include:

- Our place in our galaxy
- A universe of galaxies
- The telescope as a time machine (telescope treasure hunt
- Hubble video collection (DVD)

Black Hole Survival Kit – These activities explore gravity, and black holes as an extreme example of gravity. Activities include:

- Black Hole explorer board game
- Gravity and the fabric of space (a gravity well that has been a real hit with the galaxy explorers)
- Where are the back holes ("star maps")?

The fourth kit many of you have already seen parts of as we have beta tested some of the activities for the kit. It will cover information about telescopes and astro photography.

These kits are available to any of our club members and can be used to enhance a star party, classroom visit, or any other club or outreach event. All that is asked is that a simple report is made about the activity so that our sponsor, NASA, knows what subject we covered, how many people we have reached, and a little demographical information about them.

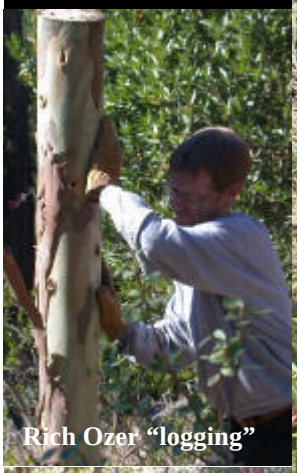
In return, we are provided with more kits as they become available, have opportunities for lectures from important astronomers, and other educational support for our activities.

If you would like to use any of these kits for your activities, or help us use a kit at one of the EAS outreach events. Please contact Paul Hoy or Carter Roberts. ★

Spare Shots (Not much room this month—sorry!)


Bill Drelling's Mars


Brian "Paul Bunyan" Cornell


Rich Ozer "logging"


Ken Swagerty cutting


Terry Galloway clearing away


John Paul Jones moving


Bob Gross tossing logs

Editor's News 'n Views

Howdy, Astro Fans! Lots of news this month, so I'll get right to it. As seen on the front cover of this issue, **Dr. Stephen Hawking**, one of the greatest scientific geniuses of our time, came to visit the Chabot Space and Science Center on Thursday, November 10, to see Chabot's new full-dome planetarium video projection system. When CSSC's Director, **Alex Barnett**, asked the current Cambridge University Lucasian Chair what he thought of the show, he replied, "spectacular!" **Carter Roberts** somehow managed to get himself appointed as the "official photographer," and **Ryan Turner** got to stand next to him to run the wheelchair elevator. **Conrad Jung** and **Debbie Dyke** got to catch glimpses of him across the planetarium before and after the show. How nice! **Tony Scott**, the Systems Development Manager for SEOS (the company that installed and is now upgrading the system) has stated categorically that Chabot's improved all-dome projection system is now "the most sophisticated, *by far*, in the world!" Cool.

The usual suspects: **Paul Hoy**, **Gerald McKeegan**, **Richard Ozer**, **Carter Roberts**, **Dave Rodrigues**, **Ryan Turner**, and I, at various times over the last month, did several astro-outreach events this month, including the Orinda Intermediate School's *Science Night*; a fair exposing kids to the fun and interesting aspects of chemistry, biology, physics, and of course, astronomy. Then, there was the *Junior Center for Arts and Science* event, and, next evening, the annual *Japanese Moon Festival*, where we looked at the full moon to the almost atavistic* beat of Taiko drums, munching on free sushi and teriyaki chicken dinners <yum!>, both at Lake Merritt. We were also present at the *Cub Scout Jamoboree* in Albany, showing sunspots and solar prominences to young bears and weebalos (what the heck is a weebalo, anyways?) and of course, there was the *Mars Mania* event at Chabot, where hundreds of beleaguered parents with their sugar-hypered, Halloween-costumed children descended upon Chabot to see the spectacle of the Angry Salmon Planet (I can't quite bring myself to call it *Red*) during it's close pass (which is still going on, I might add). Quite a busy month, and more to come. By the way, we could *really* use some more volunteers to help out with these outreach events. There's really nothing to them, and they're fun to do, *plus* you sometimes get a free meal out of it. C'mon...try it, you'll *like* it!

Gerald McKeegan caught an interesting news blurb about Tinsley Laboratories (Richmond, CA) where longtime EAS member **Bob Schalck** used to work. The October 17 issue of *Space News*, a space industry trade newsletter, says the mirror segments for the James Webb Infra-red Space Telescope are being made at Tinsley (Bob is the professional optical technician who cleans and maintains the optics for Leah and Rachel).

Proposed change to the EAS Constitution

Chabot Space & Science Center is no longer the sleepy little observatory nestled between highways, and the month of December regularly gets booked solid for corporate holiday events. So, we need to make an adjustment to our rules regarding office elections. The proposed changes are underlined:

Article VI. ELECTIONS

Section 1.0 Election of the Eastbay Astronomical Society, Inc. Board of Directors shall be held annually during the regular meeting in December. <u>If there is no lecture meeting event in December the election shall be held at the first meeting of the membership in January.</u>

Section 2.0 The elected members shall assume office at the <u>first meeting, lecture or Board, that follows the election</u>.

2006 CLUB OFFICER ELECTIONS

The nominees for the 2006 EAS Officer elections are:

President—Carter Roberts
Vice President—Paul Hoy
Treasurer—Don Stone
Meeting Events Coordinator—Dave Rodrigues
Director, Telescope Makers' Workshop—Paul Zurakowski
Director of Equipment—Ken Swagerty
Secretary—Linda Lazzaretti
Membership Registrar—Bruce Skelly
Groups Coordinator—Terry Galloway
Astrophotography Group In-Charge—Bill Drelling
Newsletter Editor—Don Saito
Board Members—Celeste Burrows, Alan Fisher, Conrad Jung, Gerald McKeegan

Thanks go to these people, who are willing to spend so much of their time and energy toward promoting amateur astronomy in our community, and for supporting the Chabot Space & Science Center. Thanks also goes to Alan Roche, who was on the Board for many years, but who by life's circumstances is now unable to do so.

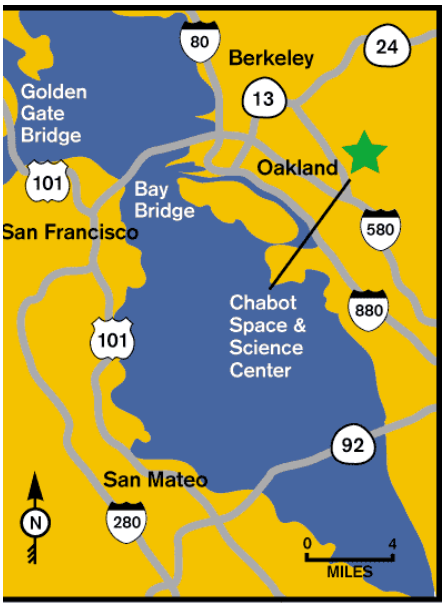
Upcoming Events

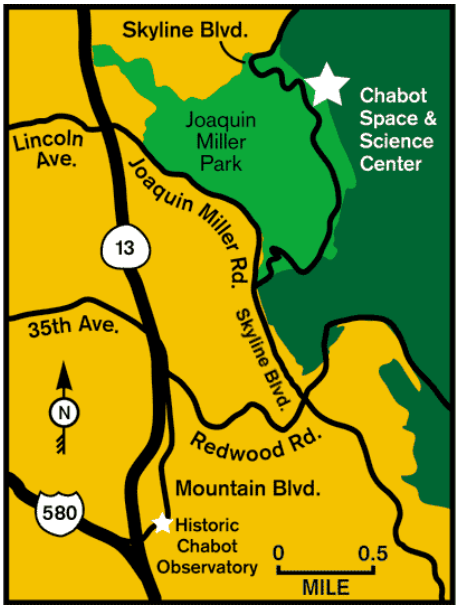
- *EAS Members Only View Night* (2nd try), Sunday, Nov 20 6:30pm, weather permitting (call to confirm if it looks questionable 510 482-2913
- Rosa Parks, Berkeley, Monday Dec 5
- Fruitvale, Oakland, Tuesday Dec 6 (rain date Thursday Dec 8)
- Woodland, Oakland, Wednesday Dec 7
- Bella Vista, Oakland, Friday Dec 9

And that's all for now! ★

Eastbay Astronomical Society

At Chabot Space & Science Center
10000 Skyline Boulevard ● Oakland, CA 94619
November 2005
RETURN SERVICE REQUESTED





FUTURE CONJUNCTIONS

Nov 6 EAS Members' Only View Night at Chabot (cancelled)
10 EAS Board Meeting, Chabot, Soda Board Room, 7:30pm
19 EAS General Meeting, Chabot, Physics Lab, 7:30pm
20 EAS Members' Only View Night at Chabot (2nd try)
Dec 8 EAS Board Meeting, Chabot, Galileo Room, 7:30
No General Meeting in December—Holiday potluck party with telescope viewing on Sunday, January 1st, instead

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: Don Stone, EAS Membership Registrar
Telephone: (707) 938-1667 Email: ddcstone@earthlink.net
Mail: 19047 Robinson Road, Sonoma, CA 95476-5517
Sign up online at http://www.eastbayastro.org/

EASTBAY ASTRONOMICAL SOCIETY
MEMBERSHIP APPLICATION FORM

☐ New Membership ☐ Renewal of Existing Membership

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)
☐ 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 shippng 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
19047 Robinson Road
Sonoma, CA 95476-5517

For more information, please contact Membership Chairman Don Stone at (707) 938-1667, ddcstone@earthlink.net, or write him at the address, above.

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.

And,
☐ 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!

Membership has its privileges…

- **Monthly newsletter, *The Refractor,*** with interesting articles on currently visible constellations, upcoming lectures, club events, stories, equipment reviews, local news, and more.

- **Monthly meetings** with featured guest speakers on all subjects from Astronauts to Zooming telescope eyepieces; from finding deep-sky objects, to planetary geology. Every and any thing having to do with astronomy, telescopes, and the space sciences. All that, and cookies and sodas, too!

- **Help and advice to new telescope owners.** Got a new telescope and don't know what to do with it? Bring it to a meeting; we'll be able to help you figure it out! If you're interested in getting a telescope, we can give you some good advice; be warned: there are a *lot* of bad telescopes out there!

- **Members-Only view nights at Chabot's large telescopes** to avoid the weekend crowds. We view galaxies, nebulae, star clusters, planets, the Moon, comets, double-stars, and whatever else is up!

- **Weekly star parties at Chabot.** Interested EAS members get trained to operate the big 'scopes (Leah, Rachel, and Nellie, the 8", 20", and 36" telescopes housed in three separate observatories) for Friday and Saturday night public viewing.

- **Yearly events:** Annual EAS Awards Dinner, star parties at nearby dark-sky sites, the Barcroft Station high-altitude star party in the White Mtns.

- **Telescope Makers' Workshop.** Friday evenings from 7–10 pm, hosted by Chabot, and operated by the EAS. For a small fee, plus the cost of the mirror and "tool," we will provide instruction and grinding/polishing supplies needed to make your own telescope mirror for less than half the cost of a store-bought one, that will likely be optically superior!

- **Advanced Astro-research Groups** using Chabot's large telescopes. Join a group to fit your particular astro-interest such as CCD or Film Astrophotography, Variable Stars, Solar, Seismological, Extra-Solar Planets, Occultations, Optical SETI, and more.

Access to Chabot's Science Library

Automatic membership in the

Astronomical League (a $16 value)

***Astronomy* and/or *Sky & Telescope* subscription discounts (a $10 value)**

+ Discounts on many items in the Sky and Telescope merchandise catalog

Join the Eastbay Astronomical Society, and begin expanding your knowledge of, and appreciation for, the night sky, our world, and the Universe!