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The Refractor

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

Volume 80
Number 13
September 2004

August 2004's talk:

EAS Members' Night
Featuring various successful trips to see the June 8 Transit of Venus

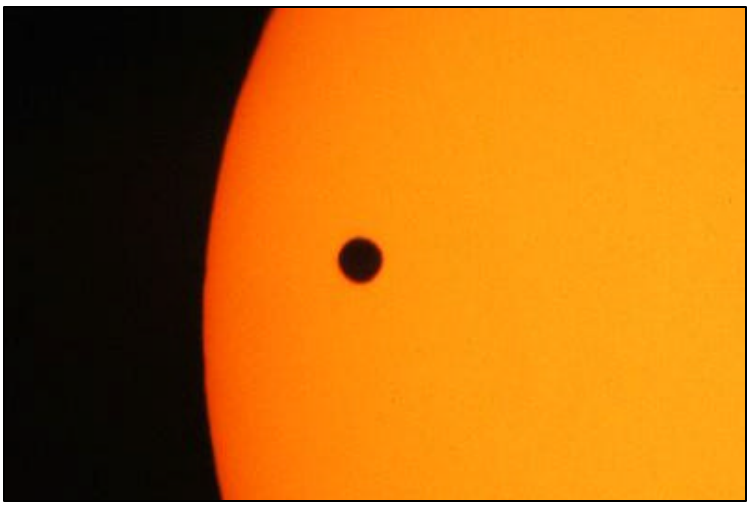
Saturday, September 4, 2004, 7:30 pm
Speakers: Carter Roberts, Rick Sarrica, Carl Trost, et al

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

Carter Roberts atop a happy, smiling late-model dromedary (camel).

Our speakers this month will show their pictures and talk to us about their various experiences going to see the rare and amazing transit of Venus across the face of the Sun (June 8, 2004). It was quite the adventure for all of them, complete with smelly, hard-to-sit-on camel rides, interesting local flora and fauna (such as a wild boar at 20 paces!), visits to crumbling Egyptian or Greek ruins, and more! They'll describe what equipment they used to view and capture the event, the challenges they had to overcome, and all the other gory details attendant to traveling to distant corners of the world in search of enlightenment.

Join us for these and possibly other presentations as we open the floor to our members, who wish to afford the rest of us a vicarious thrill or two from their own forays into *terra incognita!* ✯



Venus passing in front of the Sun—Photo by Carter Roberts

Is it time to renew your EAS membership again, *already??*

Yes it is, but get this: as of right now, the EAS has implemented online membership applications. *If you've got web access and a credit card*, you can not only apply for or renew your membership, you can also order magazines, membership lapel pins, and/or make other donations from the comfort of your web browser, because we now have **PayPal**!

Check your address label—if it says "1004" to the right of your name, you have not yet renewed for 2005. (If you get the newsletter from the web via email notice, the email message will state whether or not you have renewed, yet.) Read more about this in the *News 'n Views* column. ✯

DINNER WITH THE SPEAKER
5:30 pm
Saturday, September 4
HUNAN YUAN
4100 Redwood Rd., #11
(next to Safeway)
Oakland
(510) 531-1415
Contact Dave Rodrigues at 510/483-9191 or davevrod@aol.com by Friday, September 3, to confirm, or just show up!

Inside This Issue:

Our Solar System is a Dangerous Place
Fermi's Paradox and the Holocene Extinction

By Jim Scala

In 1933, Konstantin Tsiolkovsky said, "If advanced technological societies are possible, one should have been here by now." Eighteen years later, Enrico Fermi, physicist and noble laurite, reached the same conclusion and asked, "Where are they?" Fermi's question received wide recognition and in 1951 the question became *Fermi's Paradox.* Fifty three years later in 2004 over 100 solar systems have been discovered and we know that abundant water, life's essential substance once flowed on Mars, and Fermi's paradox is timelier than ever. Among the many answers for the silence one teaches that once established, life meets with so many obstacles that the emergence of a communicating society is so close to impossible that we are in fact, alone. In short, we can partially understand the silence by studying the extinctions that occurred here on earth.

Enrico Fermi

Earth's semi-regular mass extinctions were serious obstacles to life that by an improbable stretch of luck, we survived. Extinctions were mixed blessings that were critical to our biodiversity leading inexorably to our own technologically advanced society, but any one of them could have wiped life's slate clean and a restart would be highly unlikely since conditions were no longer correct. So extinctions are dual-edged swords that both destroy and nurture life.

Mass extinctions usually result when the Oort cloud is disrupted by a passing star (or other large body) sending large comets into the inner solar system. These first time comet showers have a higher than average probability that one or more will crash into the earth as large meteorites. Indeed, several groups have correlated these catastrophic events with Earth's passage through our galaxy's spiral arms when the Oort cloud is disrupted by passing stars. A chronology of these extinctions discloses an apparent regularity that loosely coincides with our galactic orbit.

Mars' surface is a historical document.

Consider the Martian surface for a moment with its many craters ranging in sizes up to a hundred or so miles in diameter. Importantly, planetary geologists assign ages of less than 500 million years to many Martian craters, so astronomically speaking, many are recent. This picture fits very nicely in what we know about the timing of our own extinctions caused by meteor impacts. Remember that 500 million years ago Mars had lost its atmosphere, so there was no protection against the meteor bombardment. Since the Martian surface is dormant, we can infer what probably happened to Earth, allowing that only the largest meteors got through Earth's protective atmosphere. In addition, our geologically active and weather dominated planetary surface removes the evidence of all but relatively recent craters. So, in this context think of Martian craters as historical documents.

Cambrian Extinction, 540 to 500 million years ago.

Possibly the most important extinction because shortly afterwards a tremendous diversity of life followed in which nature experimented with myriad options. In fact, all the animal phyla with which exist today emerged after the Cambrian extinction and none have apparently emerged since. In a sense, every living thing today owes its beginning to the Cambrian Extinction.

Ordovician Extinction, 440 and the Devonian Extinction, 370 million years ago.

Both these extinctions eliminated about 20 percent of the marine species. Recently some evidence has been found and corroborated for a meteor bombardment, so they fit the pattern quite well. Effects of these extinctions on land life are simply unknown because there were no animals with skeletons to leave fossils.

Permian Extinction, 250 million years ago.

Possibly the most devastating of all appears to have been caused by several meteor catastrophes that wiped out about 90 percent of marine life and most orders of insects. In comparison to the Permian, the Cambrian extinction was but a hint at how dangerous our solar system can be.

Triassic Extinction, 220 million years ago.

Most scientists agree this was caused while Earth was in a galactic spiral arm and several large meteors (a comet train?) smashed into the earth. It caused a general reduction in all living things and among the environmental niches it created, one allowed the age of the dinosaurs to commence. The earth's temperature also allowed plant life to flourish.

Cretaceous Extinction, 65 million years ago.

Selfishly, this is the most important extinction because it ended the dinosaurs' dominance allowing humans to emerge. Scientists (also some creationists) agree that this cataclysmic event established conditions in which mammals flourished. It set the stage so that about seven million years ago diminutive hominoids stood up on the African savannas in search of food and to avoid become food. The Cretaceous extinction was initiated by a large meteorite that struck the Yucatan peninsula and was followed by a few smaller strikes. If this first meteor had been 30 percent larger, it's possible all life would have been wiped out. In a sense the "biological hard drive" could have been wiped clean.

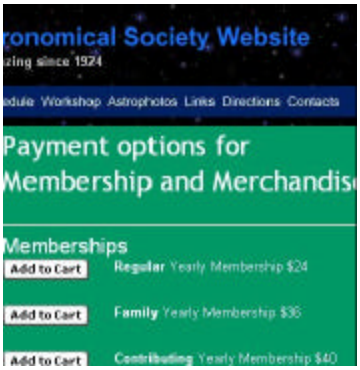
Continued on Page 4

Editor's News 'n Views

Howdy Astro Fans!

Did ya miss it? If so, not to worry: I've got a bunch of pictures and a writeup from **Nancy Cox** on what happened at this year's fabulous ASTRO CON 2004 event held here in the SF Bay Area. There were talks by famous astronomers and astrophysicists on cutting-edge subjects; there were field trips to the Chabot Space and Science Center, Lick Observatory, Muir Woods, the wine country, Sausalito, and a grand finale banquet aboard the USS Hornet, with Apollo 12 Lunar Module pilot, **Alan Bean** as the keynote speaker. I signed up to do the tour up at Lick Observatory, but missed the tour bus by 12 minutes(!), so I decided to try and catch up with 'em. Of course, it was rush hour traffic, and they had the added advantage of being able to use the commuter lanes all the way. But, I knew that once they hit the road going up Mt. Hamilton, that I could do a lot of catching up; they were a big, slow bus full of queasy flatlanders, while I was a tire-screechin', turbo-charged blue meteor! And, I did catch them up, just as the tour to see the 120" Shane reflector started <yes!> I'd been up to Lick a number of times before, but never got a chance to tour the 120-inch Shane reflector, and it was very cool. Our guide was a cute-as-a-bug young astronomer who could speak a mile-a-minute non-stop for hours with a mind that must have been a steel trap to be able to hold all that historical information, not to mention all the astronomy data. We also toured the more accessible 36" Warner & Swasey refractor (big brother to Chabot's 20") and saw a neat demo of the hydraulic roller-skating rink wooden floor which surrounds the scope being lifted from its lowest position to its highest. Sure beats having to use a roll-around ladder all the time to reach the eyepiece! And have you ever seen an astronomer lifted by a telescope? As she was pushing the big refractor up, hard, I could tell that its momentum was going to pick her up, but there was a split second of panic at the thought of it getting away from her. That sure woke us up, let me tell you! (For more on AstroCon, see Nancy's article elsewhere in this issue.)

Apollo 12 astronaut Alan Bean
Photo by Paul Hoy



Our website has been evolving a little faster, lately—have you noticed? As mentioned on the Front Page of this issue, we now have the ability to accept credit card payments for new memberships, membership renewals, magazine subscriptions, donations, calendar and lapel pin purchases, and that's just for starters! In the not-too-distant future, we will also form an alliance with Amazon.com so that if you purchase a specific item that you found and clicked on from our website, we will get a "piece of the action," so to speak, and Amazon will pay us a small percentage of the purchase price for having pointed someone in their direction. Neat, huh?

So, I'm looking for recommendations, reviews and selections of books, videos/DVDs, or whatever else that can be purchased through Amazon.com (and are appropriate to our club). This is an easy way for us to add to our coffers.

Making club membership and merchandise purchase more convenient will hopefully get more people to join us and buy our stuff. Using PayPal isn't free - it costs us 2.9% + $0.30 per transaction done through PayPal, so, for a Regular membership and subscription to Sky & Tel, a total of $56.95, PayPal's cut would be $1.95. That's not so bad, for the benefits gained.

And, finally, I'm also looking for a couple of telescope people who would like to help out at the annual **Japanese Moon Festival** at Lake Merritt's Garden Center (located just left of the entrance to Fairyland). It's an easy access, fairly low-key event that lasts around two hours. If you like Japanese food, participants get a free Japanese dinner tray, filled with all kinds of different asian/western-style yummies. If you're interested, call me at (510) 482-2913, or email donsaito@comcast.net.

It never hurts to ask! EAS Librarian and Board Member, **Paul Hoy**, was perusing the goods at Scope City in San Francisco, and spotted a very nice Astro-Physics 2.7" focuser on display. Paul immediately thought about Chabot's 36" reflecting telescope, Nellie, and how her existing focuser caused vignetting in the field of view, as evidenced by the astrophotos taken during her first year of operation. Feeling an odd mix of curious and generous that day, Paul asked the manager at **Scope City**, **Sam Sweiss**, 'how much' for the nice focuser. Sam asked what it was for, and Paul told him it would be for Nellie, to which Sam replied, "I'll donate it." (**Dr. David Gong, DDS**, obtained a new focuser and asked that Sam find a good home for this one.) *Cool!!* So, Nellie has a new 2.7" Astro-Physics super high-quality, industrial strength focuser, thanks to the Paul Hoy's sharp eye, and Sam Sweiss' generosity at *Scope City, 350 Bay St.* (btwn Mason & Powell) in SF *(415) 421-8800* open 10-7 M-F, 10-6 Sat (closed Sunday). (If you happen to go to Scope City and buy something, tell 'em we sent you. These kind of donations should definitely be well acknowledged!) That's it for now. See you – IN THE FUTURE! ✯

Holocene (recent) Extinction, 10,000 years ago and continuing.

We are living through an extinction that began 10,000 years ago that didn't start with a single cataclysmic event as characterized previous extinctions. Man started this one and while 10,000 years sounds remote to us, it is nevertheless ongoing and accelerating. It began with human encroachment on the natural environment and now accounts for species extinction 120,000 times the normal background rate! The background rate of species extinction is what we would see from climate changes, competition for food, reproductive ability and natural catastrophes, as first expressed by Charles Darwin. Darwin's terms, *natural selection* and *survival of the fittest* works for our purposes here; just remember they aren't completely correct.

This Holocene extinction began when our population had reached 5 million about 10,000 years ago when primitive societies encroached on the natural environment as agriculture became a way of providing food. What began as small groups of people growing crops has evolved into cities containing many millions of people; for example Tokyo has over 26 million. World population stands at 6.2 billion and will get to 8 billion before 2025. Our extinction is driven by basic human needs.

At its bare bones, an average person requires about 500 grams dry weight (all water removed) of food daily and a little over four liters of water to sustain basic health. These fundamental requirements form the drive behind our agriculture and the complex societies 6.2 billion people require. In all but the most marginal societies people take and use far more than the basics. A 6.2 billion population in addition to the basics uses enormous amounts of energy, produces incalculable amounts of waste and requires complex social structures just to maintain mediocre standards, let alone the affluent life style that characterizes most populations. Carl Sagan correctly observed that from 35,000 feet our cities look like cancers growing on the surface of a verdant blue-green living globe. In 2004, many planetary biologists view the Earth as a living entity and Sagan was right on.

Our current approach to environmental preservation ignores the fundamental challenges and attention is usually diverted by emotional issues raised by well intentioned people. For example, more trees are now growing in the continental USA than when the pilgrims landed in 1620; yet forest fires are more devastating than ever because we argue over forest thinning. While we argue, obliteration of tropical rain and hardwood forests with their incredible species diversification and oxygen generating capacity continues unabated. At the same time destruction of aquatic habitats with similar diversity and contributions to the environment is accelerating and goes largely unnoticed and ignored. Our quest for life's essential water has already had an impact that is cataclysmic, but has a long way to go as worldwide affluence accelerates.

Earth's survival depends on our ability to view this planet as a living entity that must be nurtured and cared for just as 10,000 years ago primitive people cared for their cabbage crops to get a better way of life. However, a holistic approach seems presently beyond our reach and the Holocene extinction continues unabated and is accelerating. This is happening even though we have the technical knowledge to maintain a thriving, living planet with eight billion people. In contrast, to seriously reach for the stars, energy requirements dictate that we cannot be mired in simply maintaining an enormous population; something's got to give.

Consider Fermi's Paradox in this context.

It is compelling that we haven't heard a radio or an optical signal or seen a Bracewell-Von Neumann probe that would prove, "We're not alone." This brief review of extinctions teaches that the solar system is a dangerous place. It follows that any earth-like planet will face similar and possibly worse catastrophes, making communicating societies scarce; possibly impossible. Yes, we have best the odds so far because so many improbable events came together so well. Scientists now cite the Holocene extinction as nature's most insidious obstacle to the survival of technological societies. They say we might not survive the extinction we unintentionally created and, there is much evidence that this has happened to other species before.

Many scientists have already concluded that Fermi's Paradox says we are alone even though they subscribe to search programs unabashedly displaying their hopes against all odds. In this context, the Holocene Extinction is testing us even more than the past extinctions tested life. If we don't gain control over this current extinction, will we be swept up along with the other plants and animals that are already gone? Will Earth remain as a mute reply to Fermi's question? We can't let that happen.

About the author.

Jim Scala an EAS member is a biochemist by education (Columbia, Cornell and Harvard), a retired author and nutritionist by profession and an amateur astronomer by choice. La Scala observatory (in Jim's backyard) houses a 228-mm APO refractor where he enjoys CCD astronomy. He welcomes visitors and enjoys discussing things astronomical; especially the subject in this article. Contact Jim via e-mail at: jscala2@comcast.net; website: http//home.comcast.net/~jscala2 ✯

AstroCon 2004

or, The Mother of all Astronomy Conferences

by Nancy K. Cox, SFAA

Imagine hearing about the latest on the planets, variable stars, astronomy education and outreach, current and future space missions, and a celebration of the Apollo moon landings all at the same conference. That's what happened when the A.L.P.O. (Association of Lunar and Planetary Observers), A.A.V.S.O. (American Association of Variable Star Observers), ASP (Astronomical Society of the Pacific), AL (Astronomical League), and the AANC (Astronomical Association of Northern California) all decided to hold their annual meetings at the same time, in the same place. It was called **AstroCon 2004**, and it was held July 20 - 24 at the Doubletree Hotel on the famous (*infamous*) Berkeley Marina. (I'll leave that remark to your imagination – just think of the initials S.P.)

It was also a conjunction of everyone who's anyone in amateur astronomy in the Bay Area and beyond. It was a lot of fun bumping into old friends and acquaintenaces every time you turned around during the four days.

There were papers sessions held by each organization for one or two days. ALPO gave a presentation on last year's close approach of Mars, including some spectacular CCD images by Don Parker of Florida. Highlighted were changes in Mars' features during this opposition, compared with previous oppositions (most of these changes due to shifting dust/sand storms). There was a talk on recent Jupiter observations during its appearance in 2004, discussing how a smaller storm oval gets scrunched as it moves past the Great Red Spot. All of the above results still to be published in the ALPO journal, *The Strolling Astronomer*. Dr. John Westfall, past ALPO president, and journal editor, gave a talk on the historic (and rare) June 8, 2004 transit of Venus, which he observed from the island of Cypress in the Mediterranean Sea. These transits occur more than 100 years apart, and they come in pairs, 8 years apart, so the next one is in 2012 and will be visible from the west coast of North America, so stay tuned and get ready!

The venerable AAVSO was mourning the sudden loss of their President, Dr. Janet Mattei, who died of acute leukemia a few months ago. She did much to expand and improve the organization - an organization which truly proves that contributions (in the form of variable star observations) from amateur astronomers are extremely valuable to professionals studying stellar evolution.

The renowned David Levy gave as his keynote talk an emotional biography of his friend and colleague, Janet Mattei. Other AAVSO presentations included a talk on how AAVSO is re-cataloging the thousands of variable star observations and light curves recorded since 1911 – all being redone on computer, so they can be of better use to all researchers. Also given was a talk on how AAVSO comparison star finder charts are being updated (these can be downloaded off the web). Of course there were presentations on the behavior of different kinds of stars, including cataclysmic variables (these are the ones that become periodic novas – a "normal" star that has material pulled off

Comet Finder David Levy talks at AstroCon 2004
Photo by Conrad Jung

Telescope viewing from the flight deck of the USS Hornet
Photo by Carter Roberts

AstroCon 2004 Chief Organizers Jane Houston Jones and her husband, Morris Jones outside the Shane 120" reflector to catch the sunset from the Mt. Hamilton/Lick Observatory telescope complex
Photo by Don Saito

Continued on Page 6

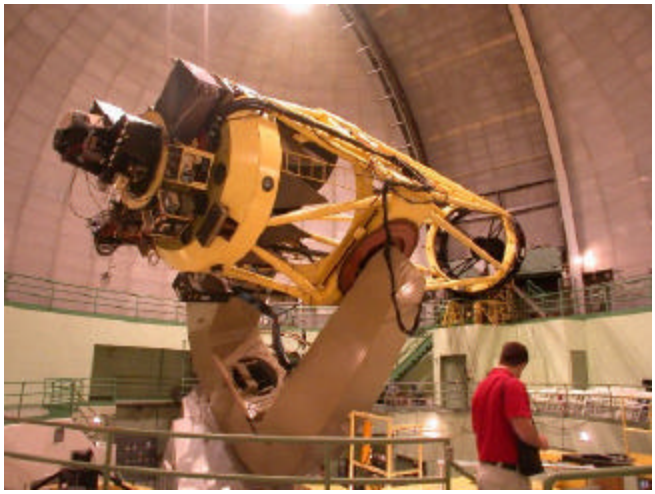
Banquet on the hangar deck aboard USS Hornet
Photo by Don Saito

Continued from Page 5

onto an accretion disc by a hotter white dwarf companion star), and R Cor Bor stars, named for their prototype in Corona Borealis; these are "carbon stars" - older stars that periodically blow off their outer envelope of carbon, and the star almost literally "disappears" for a few months, being covered by the carbon "soot." Also, on Mira type (long period) variables – up to a year or two pattern of dimming and brightening. Besides collecting light curve data, amateurs of AAVSO can alert professionals when outbursts of different kinds of stars begin, so they can be observed in other wavelengths by space satellites.

The ASP and the AL presented a mixture of talks having to do with efforts at astronomy education and outreach – very important efforts in our attempts to educate the public about science, and enlighten them to the joy and realities of this beautiful universe we live in. Jeff Marcey, the extra-solar planet finder extraordinnaire, was the speaker at the annual ASP Banquet, held on the Thursday evening of the conference.

There was a potpourri of other talks/papers on such topics as: plans by a private organization (in conjunction with the Planetary Society) to launch a solar sail, which would "fly" between planets using something akin to the solar wind. Another private group (from a university) promotes balloon investigations of "Near Earth Space," which goes high up in the atmosphere of Earth, above the stratosphere (the region of weather and clouds), to take pictures of the earth below, and to study such phenomena as cosmic rays. They were even looking for volunteers to help with an experiment to grow seeds – controls that stayed on earth, and other packets of seeds that were flown into near-earth space, to see if there are any effects from cosmic rays, and such. During a panel discussion on current planetary exploration, "our" Jane Houston Jones (now employed at JPL in Pasadena), gave us an update on the Cassini mission, which has just arrived at Saturn, and will be orbiting and studying it for the next few years; she also spoke of her Saturn outreach efforts.



Shane 120" reflector, Lick Observatory complex, Mt. Hamilton Photo by Don Saito

Always at ventrues like this, there are vendors (and door prizes), and at AstroCon 2004 there were plenty, including: rare/used book sellers, such as Norm Sperling of *Everything in the Universe* and his new acquisition, *The Journal of Irreproduceable Results*, the science humor magazine; several of the major telescope manufacturers; meteorite samples for sale (Mike Martinez and his *Mare Meteoritics*), IDA - the International Darksky Association – a very worthwhile cause; the Planetary Society, promoting 50% off memberships for conference attendees; various NASA freebies, and tables and literature from all the sponsoring organizations, information about joining, sunspots for sale (ha ha, that was Coronado Telescopes demonstrating their h-alpha filters on the breaks, in the courtyard – some nice prominences were seen). There was also nicely designed conference t-shirts and pins available.

The crowning climax to this four-day astro-fest was on Saturday evening, with the concluding banquet (and annual awards given out by the various organizations beforehand), held on the flight deck of the USS Hornet aircraft carrier (as long as 2 or 3 football fields), now a permanent museum, berthed in Alameda. The date was July 24, 2004, 35 years to the day when this very ship picked up the first moonwalkers, the Apollo 11 astronauts, after their return splashdown back on Earth. In honor of the occasion, the featured speaker was Apollo 12 astronaut Alan Bean, who gave a fascinating and animated talk on what it was like to go to and be on the moon – including such tidbits as the odd experience of the low gravity, or the lunar "dirt" being everywhere, being very fine and tenacious (like graphite pencil shavings). Most of all, he emphasized how ordinary people (and he considers himself one – "I was just a pilot") can do extraordinary things – if they put their mind to it, with a "can do" attitude. He feels this is what made the Apollo moon program so successful; an attitude that could apply to the problems and challenges of our day.

After the dinner, former astronaut Bean signed copies of photos and of his book (he is an artist, who has spent his life since his moon walk painting pictures of what it was like to be in space). He was most generous with his time, answering our questions and listening to our comments. He was a most down-to-earth person (pun intended - and it is the truth), for someone who has walked on the moon (one of only 12 humans who have done so). It was an extreme thrill to meet him, and to shake his hand, and it was an extremely fine conclusion to a fabulous astronomy conference – AstroCon 2004! ✯

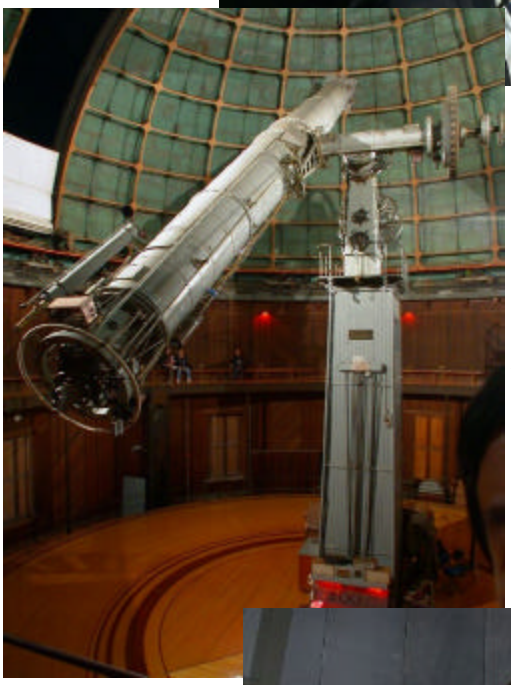
Spare Shots

Apollo 12 astronaut Dick Gordon speaks at AstroCon 2004 aboard the USS Hornet Navy aircraft carrier that plucked he and his crewmates from the South Pacifc Ocean on Nov 24, 1969 (photo by Carter Roberts)

Mike Rowe of KPIX Ch 5 television does a report from the 20" dome at Chabot (photo by Don Saito)

Don Blair did radio broadcasts from the USS Hornet to the world during the Apollo 11 recovery mission (photo by Carter Roberts)

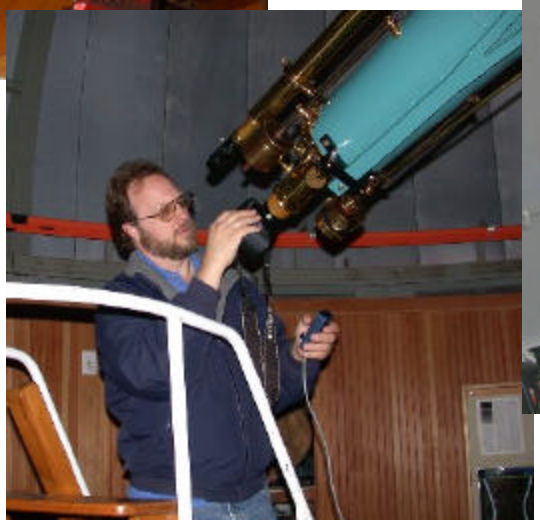
Mike Reynolds at Luxor, Egypt, viewing the Transit of Venus (photo by Carter Roberts)



The gigantic 36" refracting telescope at Lick Observatory at, Mt. Hamilton, with pneumatically adjustable floor visible, below (photo by Don Saito)

Barcroft Station (photo by Carter Roberts)

Dave Rodrigues shows Apollo astronaut Alan Bean the "Quarter Trick" (photo by Carter Roberts)



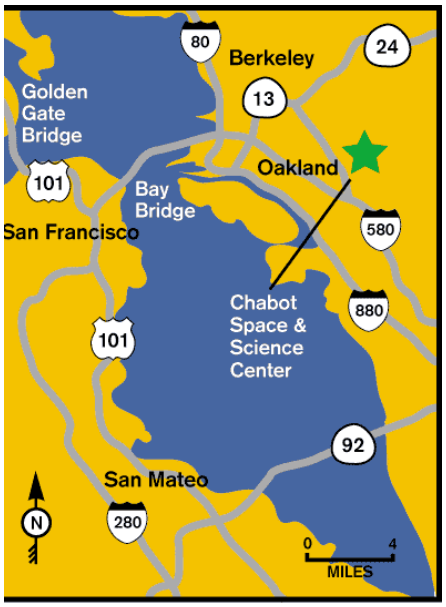
Paul Hoy works with Chabot's antique 8" telescope, Leah, to get astrophotos of Venus (photo by Don Saito)

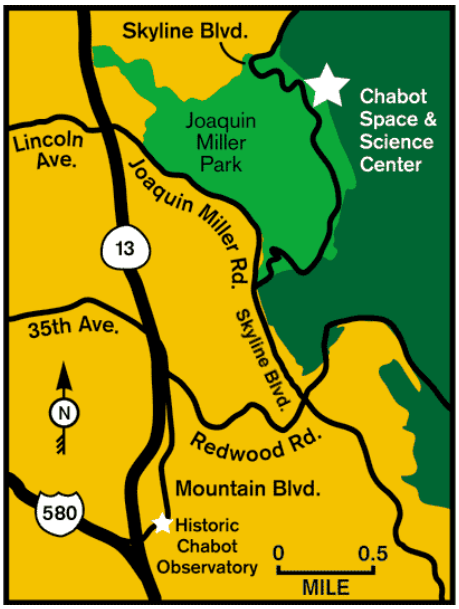
Eastbay Astronomical Society

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

September 2004

RETURN SERVICE REQUESTED





FUTURE CONJUNCTIONS

Sep	4	EAS General Meeting at Chabot, 7:30pm Physics Lab
	16	EAS Board Meeting, Chabot, Soda Board Rm, 7:30pm
	19	EAS Members Only View Night at Chabot
Oct	2	EAS General Meeting at Chabot, 7:30pm Physics Lab
	16	EAS Board Meeting, Chabot, Soda Board Rm, 7:30pm
	17	EAS Members Only View Night at Chabot

Join the Eastbay Astronomical Society

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

Contact: Don Stone, EAS Membership Registrar, Telephone: (707) 938-1667 Email: ddcstone@earthlink.net
Mail: 19047 Robinson Road, Sonoma, CA 95476-5517

☞ *New* memberships sent in from August—October will receive free newsletter(s) (Sept & Oct) before the start of the next membership year in November, when the regular 12-month subscription actually starts.

EASTBAY ASTRONOMICAL SOCIETY
2005 Membership Application Form

Name:_____

Address:_____

City/State/Zip:_____

Phone:_____ Email:_____

☐ I prefer to receive a mailed, paper newsletter*

Membership Type (check one):
- ☐ $24 Regular
- ☐ $36 Family
- ☐ $10 Student (PDF newsletter option only)
- ☐ $40 Contributing
- ☐ $60+ Sustaining

sub-total $_____

Donations:
- ☐ Betty Neall Award of Merit
- ☐ Burns Library Fund
- ☐ Extra Solar Search Fund
- ☐ General Fund

sub-total $_____

Magazines & Merchandise:
- ☐ $29 1-year Astronomy Magazine subscription
- ☐ $32.95 1-year Sky & Telescope Magazine subscription
- ☐ $25 2005 Astronomical Calendar
- ☐ $4 each per EAS Membership Lapel Pin(s) #_____

sub-total $_____

Total $_____

Please make your check or money order out to: **Eastbay Astronomical Society** and mail it and this form to:

Treasurer, Eastbay Astronomical Society
19047 Robinson Road
Sonoma, CA 95476-5517

* By default, newsletter is sent via email notification of the web-published version (in PDF format) and can be viewed with a free Adobe Acrobat Reader. We highly recommend getting the newsletter in this fashion as it is in full color, faster delivery, helps the environment (no wasted paper), and saves the club time and money.