



The Refractor

The Bulletin of the Eastbay Astronomical Society

Founded in 1924 at Chabot Observatory, Oakland, California

Volume 75
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October 1998

EAS Tours the New Chabot Observatory & Science Center

Chabot Observatory & Science Center Site

10600 Skyline Boulevard, Oakland

Saturday, 10 October, 1998

5:00 PM - Picnic/Barbecue • Star Party until 11:00 PM

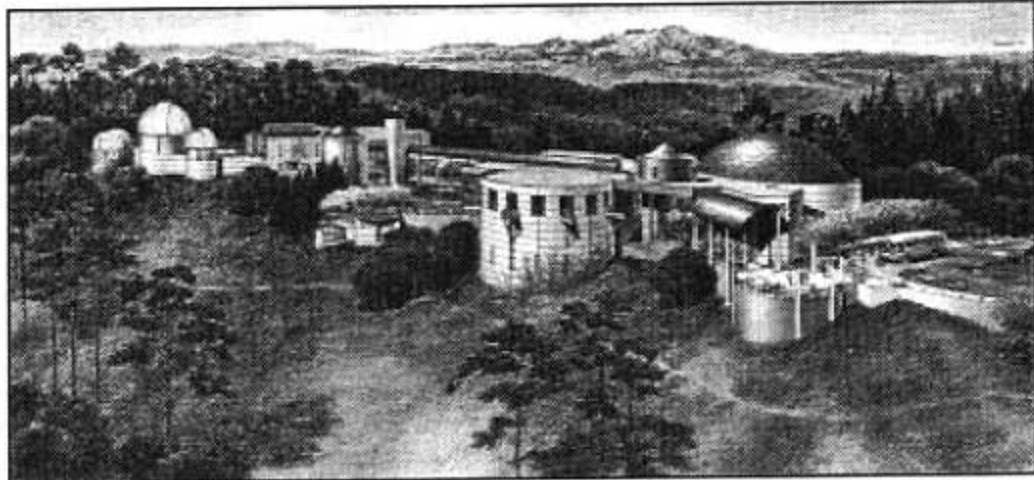
On Saturday, October 10 (*not* the Third, as previously announced), the Eastbay Astronomical Society will have a very different type of meeting. This special treat will begin with a picnic barbecue, then our first official tour of the new COSC, which is currently under construction. This will be followed by a star party. Bring your family, your appetites, your curiosity, and your telescopes and binoculars.

The festivities will begin at the new COSC site off Skyline Boulevard in the Oakland Hills. The meeting (barbecue and site tours) will begin at 5:00 PM. Please watch for signs ("EAS Picnic") directing you where to park, then other signs to the picnic area.

EAS members are asked to bring a dish for dinner (salad, vegetable dish, or dessert); Chabot and EAS will supply hot-dogs, hamburgers, and drinks. It is rumored that Chabot Executive Director Dr. Mike Reynolds will don his Executive Chef's hat and take charge of the barbecue!

Then, wearing his Executive Hard Hat, Mike will lead small groups of EAS members on an extensive tour of the construction. EAS President Carter Roberts and Dr. Terry Galloway will share this duty as well. Hard hats will be furnished, but please

wear comfortable and protective shoes, as well as clothes that you do not mind getting dusty! The tours will give members a close look at the construction. Mike will explain the progress and function of each of the structures, help us visualize the new facilities, and tell us how we can help in the overall program of the new Chabot. As it gets dark, we will have an on-site star party that will allow us to check the quality of seeing at the site for ourselves. Members are urged to bring their own telescopes. This is our first opportunity for an organized observing event



at the new Chabot site. We will observe until 10:30 or 11 o'clock, if weather permits. All are welcome!

In case of rain we will meet at 7:30 at Chabot Observatory on Mountain Boulevard, but if

only fog or clouds intervene the show will go on—barbecue and site tours, but not the star party. Dave Rodrigues will give a presentation for the general public and Mike will give an overview about the new Chabot Observatory and Science Center.

Phone calls to Betty Neall at (510) 533-2394 to tell us how many in your family will attend will let us know how many hot dogs to have on hand. To reach the new location, drive up

Redwood Road to Skyline Blvd. Turn left, then go less than a mile to where Skyline joins Joaquin Miller Road. (If you are driving south on Highway 13, use Joaquin Miller Road, then turn left onto Skyline at the top of the hill.) Go right on Skyline until you find the Chabot construction zone. See the map in Carter Roberts' column inside.

The largest and most-visited planetariums in the United States are out to change their offerings from simple constellation tours to immersive, interactive experiences. In addition to its planetarium, the domes of Oakland's rebuilt Chabot Observatory and Science Center will house several telescopes. Chabot's new 36-inch reflector will be one of the largest public telescopes in the U.S.

...Sky & Telescope, October 1998



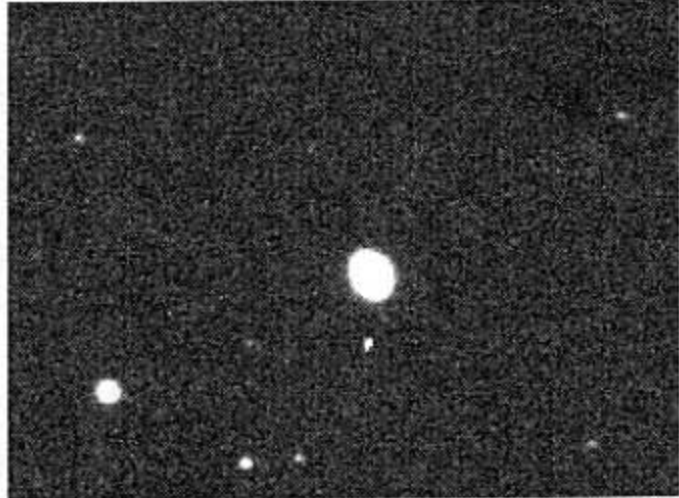
Draco, the Dragon of the North

represents not one serpent of myth, but several. The legend of Marduk is repeated in many cultures with similar tales of dragon slayers. Perseus, Hercules, Cadmus, Siegfried, Beowulf and St. George are all examples. Among these stories are the oldest of all, for some were first told when Thuban was the Star of the North—the Pole Star—some 4000 years ago.

Chaldea was an area along the Euphrates River in what is now Iraq; and the Chaldeans were among the first astronomers. Their dragon Tiamat was a sea serpent who existed even before the sea and the sky had separated from a chaos at the beginning of the world. She was a monster of primeval darkness, who had to be overcome by the powers of sunlight before creation could take place. As time progressed the first gods ascended from the primordial sea and entered into conflict with the force from which they sprang, the evil leviathan Tiamet. But Tiamet rose to the challenge and created evil creatures with poisonous fangs or scorpion stings to help her in the fight. The gods took fright and retreated to safe havens in the sky, with no one—mortal or divine—brave enough to stand against the horde.

At last, however, Marduk of Babylon accepted the challenge and was sent as a champion. At a council of war each of the gods bestowed on him magic powers, and he was sent down to face the ocean monster in battle. But even he trembled and nearly lost heart at the sight of his enemy. He commanded the winds of heaven to blow before him into the face of the foe. As Tiamet opened her mouth in surprise, the winds tore open her jaws with hurricane force and the beast was split asunder. Marduk finished the job with a great club and chased away the army to their place in chaos, since they had no power without the direction of their evil mother.

The north wind carried away the dragon's blood, and Marduk tore Tiamet's skin into two pieces. These he used to divide the chaos, and he established heaven and earth. He set aside a home for the gods and created the constellations. He devised the zodiac and the paths of the stars in the sky in a way that they would mark the days, seasons and years. Then he rested from



This is a CCD image of the planetary nebula NGC6543 in Draco, taken September 1 from outside Chabot Observatory. Conrad Jung used his 6-inch Maksutov telescope; the exposure was 40 seconds. Judged to be one of the best planetary nebulae in the sky, at low magnification it looks like an egg.

his labors and accepted the praise of both gods and men as the dragon slayer.

Draco is a circumpolar constellation which reaches more than halfway around the pole from a right ascension of 9h30m to 20h40m; it varies in declination from 48 degrees north to 86 degrees—a large area indeed. It wraps around Ursa Minor and also borders Camelopardalis, Cepheus, Cygnus, Lyra, Hercules, Bootes, and Ursa Major. Of 130 naked-eye stars according to the 19th-century German astronomer Argelander, there are only 18 stars through magnitude 4.9, the brightest being Eltanin (from the Arabic for dragon), a double star with components of magnitudes 2.4 and 13.2. Rastaban, β -Draconis, and Eltanin were considered by the ancients to be the dragon's eyes.

The best known star in Draco is Thuban. About 2800BC this star was likely much brighter than it now appears, for not only was it the Pole Star, less than ten minutes from the exact pole, but it was designated α -Draconis, presumably the brightest star then in the constellation. This was the time when the pyramids of Egypt were being built. Although there is some doubt, some claim that a descending corridor leading into the depth of the Great Pyramid of Pharaoh Khufu was aligned so that Thuban would be visible, even in daylight, by sighting along the shaft.

By precession of the equinoxes, Thuban will once again become the North Star, but this will not be until about the year 23000, as it takes just under 26000 years for a complete revolution of the Earth's wobble. In the meantime, Polaris will draw even nearer to the actual pole until 2102, but will then give way to Alrai (Gamma Cephei) by the year 4000; after that, Vega stands to inherit the title about 15000AD.

Draco has a number of double stars that merit your attention. Nu Draconis is a pair of pretty, pale-yellow stars of equal magnitude 5.0, for example.

Draco is the location of the radiant of the Draconid meteors, as discussed in José Olivarez's column; it serves as the radiant for the Quadrantids of January, too, and for the lesser Eta Draconid shower of late March.

Space Shuttle Discovery

is scheduled for launch on October 29, 1998. The primary objective of this flight is to conduct a variety of science experiments carried in the pressurized Spacehab module, the deployment and retrieval of the Spartan free-flyer payload, and operations with the HST Orbiting Systems Test and the International Extreme Ultraviolet Hitchhiker being carried in the payload bay.

The STS-95 crew will be commanded by Curt Brown, who will be making his fifth Shuttle flight. The pilot, Steve Lindsey, will be making his second flight. There are three mission specialists assigned to this flight—Scott Parazynski, making his third flight, Steve Robinson, making his second flight, and Pedro Duque from the European Space Agency who is making his first flight.

Chiaki Mukai, from the Japanese Space Agency will be making her second flight as payload specialist. John Glenn, who thirty-six years ago made history when he strapped himself into a nine-by-seven-foot capsule atop an experimental rocket and became the first American to orbit the Earth, will be making his second flight. Since aging and space flight share a number of similar physiological responses, the study of space flight may provide a model system to help scientists interested in understanding aging. Some of these similarities include bone and muscle loss, balance disorders, and sleep disturbances.

Yosemite Stargazing *By Carter Roberts*

Labor Day weekend was assigned to the Tri-Valley Stargazers to provide three nights of public viewing at Glacier Point in Yosemite National Park. The area once occupied by the hotel has been renovated into an open amphitheater with a fabulous view of Half Dome and Nevada and Vernal Falls.

Friday evening was overcast and the only observing was late in the evening when the Moon and Jupiter became visible from the Bridalveil campground.

Saturday morning was sunny. Large sunspots and prominences were visible through the telescopes. The view of hikers on top of Half Dome was also very popular. By three PM a steady rain had begun that caused most of the 25 members of our group to go home. Once again there was no evening viewing session.

Sunday morning was beautiful with even more water over Yosemite Falls creating an even more intense rainbow than the day before. Several very large prominences were visible. An early afternoon shower caused a quick retreat but soon the Sun returned and we set up two telescopes again. By now only three people remained to bring astronomy to the public—all EAS members and better known for their activities in organizations other than Tri-Valley: Dave Rodrigues, our Program Chairman; SFAA President Al Stern, active on both sides of the country; and this columnist, recently elected to the board of the RTMC. A phone call to longtime friend and meteorologist Mike Pechner revealed that we were likely to have more showers but clearing during the evening. The clouds parted to reveal Jupiter next to the Moon with Saturn to the east. Seeing conditions were excellent with the Questar at 160x showing diffraction rings around Jupiter's Galilean moons. Our last visitors, a group of Japanese tourists, arrived about midnight. It was fascinating to watch the changing lighting on Half Dome over this 17 hour day.

Comet Comments *by Don Machholz*

Periodic Comet Giacobini-Zinner continues to brighten in the evening sky, while the fainter Comets Meunier-Dupouy and LINEAR linger nearby. Two new comets have been discovered, one remains bright.

On August 10 Peter Williams of Australia visually discovered a new comet near the south polar region. He was using a 12" reflector (f/6) at 72 power for the find. Williams was not comet hunting, but instead was examining the variable star EK TrA. He then started sweeping northward to another variable star when he spotted the comet. Comet Williams has a retrograde orbit that places it near the far side of the Sun when at perihelion (Oct. 18). Northern Hemisphere observers will have their first chance to observe it in December when the comet will be visible in the southern morning sky at magnitude nine. [Ephemerides for C/1998 P1 (Williams) can be found on the Internet at <http://members.aol.com/cometcom/index.html>]

The LINEAR project found a new comet on August 24. C/1998 Q1 is quite small and will remain faint.

Comet Hunting Notes: Williams' comet discovery brings the total number of Australian visual comet discoverers to five; this is now half the number of Americans who have visually found comets since 1975. There are only two other Southern Hemisphere comet discoverers: Austin of New Zealand and Campos of South Africa. All 24 comets found by these seven men were discovered south of the celestial equator, 23 being found by only one discoverer.

Peter Williams is the first person to qualify for the Edgar Wilson Award: a cash sum of about \$20,000 to be divided up among all the amateurs who discover comets before June 11, 1999.

Date (00UT)	R.A. (2000)	Dec.	Elong.	Sky	Mag.
21P/Giacobini-Zinner [Aquila-Ophiuchus]					
10-04	17h28.1m	+08°42'	73°	E	10.5
10-09	17h41.1m	+06°44'	72°	E	10.3
10-14	17h55.4m	+04°40'	71°	E	10.0
10-19	18h11.0m	+02°28'	70°	E	9.8
10-24	18h27.8m	+00°11'	69°	E	9.6
10-29	18h46.3m	-02°13'	69°	E	9.4
C/1997 J2 (Meunier-Dupouy) [Aquarius]					
10-04	21h00.1m	-05°03'	125°	E	12.0
10-09	20h58.9m	-06°34'	119°	E	12.1
10-14	20h58.2m	-07°58'	114°	E	12.2
10-19	20h58.0m	-09°15'	109°	E	12.3
10-24	20h58.3m	-10°26'	104°	E	12.4
10-29	20h59.0m	-11°30'	98°	E	12.5
C/1998 M5 (Linear) [Lyra]					
10-04	19h33.6m	+39°32'	103°	E	10.3
10-09	19h23.3m	+39°01'	99°	E	10.3
10-14	19h14.5m	+38°29'	95°	E	10.2
10-19	19h07.1m	+37°56'	91°	E	10.2
10-24	19h01.0m	+37°26'	87°	E	10.1
10-29	18h56.1m	+36°59'	83°	E	10.1

José's Observations



by José Olivarez

The Fall of 1998 will turn out to be a season of bountiful meteors. Four annual meteor showers will radiate meteors under ideal dark-sky conditions in October, November, and December. Two of these showers (the Draconids and the Geminids) can be seen in the evening hours, and the other two (the Leonids and the Orionids) can be seen after midnight. Also, the Draconids may produce a healthy bounty of meteors and the Leonids may produce its second meteor storm of the century. Here are the meteor shower dates and details:

Draconid Meteor Shower. Evening of October 8

This shower is sometimes called "the Dragon's Tears" because the meteors appear to come from the head of the constellation of Draco the Dragon. The source of these meteors is the dust from the tail of Comet Giacobini-Zinner. We see the meteors produced by the dust of this comet best when the comet is nearby; and our proximity to the comet this year may produce one of the best meteor showers. While other meteor showers peak only after midnight, the best time to view the Draconids is in the evening hours. So gather up your family for an evening of relaxing meteor watching from a site that has minimum light pollution. The meteors will appear to come from the north-northwest. No optical aid is needed to see these meteors—just look up!

Orionid Meteor Shower. Morning of October 21

This is a weak meteor shower and you can expect to see only 10 to 15 meteors per hour. However, their parent comet is Comet Halley. Although Comet Halley has long faded from our skies, we can still see its dust debris burn up in our upper atmosphere as the Orionid Meteors every year on the morning of October 21. The Orionids radiate from a point just north of the bright orange star Betelgeuse which marks the right shoulder of Orion, the hunter.

Leonid Meteor Shower. Morning of November 17

To see part of what may be the second meteor storm of this century (the last one was in 1966), start watching just before midnight on the night of November 16 and continue watching through the early morning hours of the 17th. The Leonids is usually a weak annual meteor shower that always peaks on the morning of November 17, but this year (or in 1999) it may storm and produce thousands of meteors per hour. Currently, the Leonids are expected to peak over Asia (if it happens in 1998) but everyone who watches on the morning of November 17 should see a very good meteor shower if not a "storm."

The comet responsible for the Leonids is Comet Tempel-Tuttle which passes through the inner solar system every 33 years. Last February 27, Tempel-Tuttle made its closest approach to the Sun in three decades; and on November 17 the Earth will plow through its dust field! Storm or no storm, the Leonids is the most anticipated meteor shower this year! To see these meteors best, select a viewing site with minimum light pollution.



One of the most spectacular meteor showers of recent times was this great Leonid shower of November 17, 1966, estimated to exceed 2000 per minute. This photo represents a 43-second exposure against the stars of Ursa Major.

Geminid Meteor Shower. Evening of December 13

This is another very active meteor shower that can be watched in the evening hours. On Sunday evening, December 13, you may see up to 100 meteors per hour streak in all directions from the constellation of Gemini. The meteors appear to radiate from a point near the two bright "twin stars" of Gemini, Castor and Pollux. So, again, gather up your family for a cool relaxing evening of meteor watching. No optical aid is needed but select a viewing site with a maximum view of dark sky and minimum light pollution.

While the source of most meteor showers can be traced to dusty debris from active comets, the Geminids have a more unusual source—an asteroid. It has been shown that the Geminid meteoroids share the same orbit with an asteroid designated as 3200 Phaethon.

Eastbay Astronomical Society

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Immediate Past President:	Betty Neall, <i>ex officio</i>	(510) 533-2394

Articles and photos for *The Refractor* are encouraged. Deadline for the November issue is October 21, 1998. Items may be submitted by mail to the editor, Ellis Myers, 215 Calle La Mesa, Moraga, CA 94556. Internet e-mail address: eas@silicon.com. For further information please call (925) 284-4103.

Internet: <http://silicon.com/~eas> • <http://chabot.cosc.org/~cas>

Roberts Rules

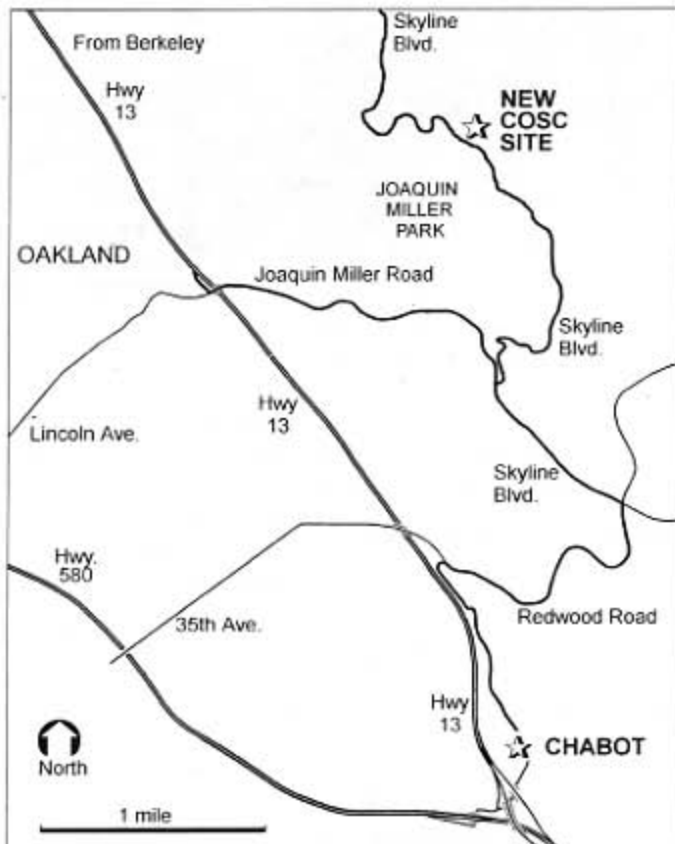
By Carter Roberts

The most important message I have for you is that the membership year of the EAS ends with the end of this month. Think of it as Treasurer Don Stone knocking on your door not with "Trick or Treat?" but with "Your money or your membership life!" [Editor's note: Surely you wouldn't want to miss a single issue of the *Reflector*!] Particularly important is renewals of subscriptions to *Astronomy* or *Sky & Telescope*. If you have any questions about how much to pay, please call Don Stone at (510) 733-6738. Consider, if you will, increasing the level at which you contribute to the activities of the Society.

The celestial event known as *MoonDazzle* should attract lots of EAS members to a mix of music and stargazing. Hosted by Cal-State Hayward and COSC, this year's party will feature Dr. Sally Ride, along with the University Jazz Ensemble. Put it on your calendars for 5:00 to 10:00 PM, Friday, October 23. Tickets are \$6 in advance, or \$8 at the site, with CSUH alums and students with ID at \$4. Children 12 and under are free. Another way to get in free is to volunteer to bring your telescope and help out. Call COSC or CSUH for information.

Of note is the recent election of Robert Garfinkel, a recent speaker at EAS, as a Fellow of the Royal Astronomical Society. Bob is the author of the popular astronomy book *Star Hopping*, and he prepares the monthly star charts that appear in the ASP magazine *Mercury*.

The October meeting of the Eastbay Astronomical Society is one we've looked forward to for a long time—our opportunity to see that the new COSC is under way. Come help us celebrate! Here's how to get there:



Reynolds Wrap

By Mike Reynolds, Ph.D.
Executive Director

With the article in the October 1998 issue of *Sky & Telescope* entitled "The Changing Face of America's Planetariums" the new Chabot Observatory & Science Center—specifically the planetarium in this case—continues to receive great press over a year prior to opening (and in the case of the article in last year's *Astronomy* magazine, two years!). We will be making the first inspection trip later this month of our Zeiss Universarium Mark VIII. The Zeiss Mark VIII is due for the final inspection in May 1999, with installation completed less than a year from now!

One of the difficulties with planning for the new Chabot has been prognosticating the total price tag of the project. As we all know, construction costs have really skyrocketed (or, should I say "become astronomical!") in the Bay Area. We were very fortunate to receive significant support both at the State and Federal level for additional funding, with a match from the Wayne and Gladys Valley Foundation. We still need to raise capital campaign funds, but believe the end is truly in site. There will be opportunities for all of us "little guys and gals" to also contribute towards the capital campaign.

I hope several EAS members will be able to attend Chabot's 1998 Fund-raiser on Tuesday, 17 November. This should be an extraordinary event—just think, you can first "Cruise to the Cosmos" with Chabot then come back and watch the Leonids (unless you're like Carter and in China to see the Leonids).

I have fielded numerous questions regarding next year's eclipse expedition; thanks for all of the interest. We hope to finalize the "major speaker" for the cruise shortly (you won't be disappointed). The land expedition is also quickly filling; for many of us it will be a special eclipse because it is the last total solar eclipse of the Millennium! Please feel free to contact me (510-530-3480 x54 for the eclipse line) or Carter Roberts if you have any questions. I suspect both expeditions will be filled shortly, so let us know if you are interested.

Finally, let me extend a personal invitation to each of you to attend the October 10th meeting of the Eastbay Astronomical Society. It is indeed my great pleasure to host you at the new Chabot site for food, astrofellowship, observing, and a tour of the construction site. Yes, the Chabot Executive Director does a great barbecue (I'm from the South; what else would you expect?). I look forward to seeing you on October 10th!

Keep looking up.

Keep the Change, Don!

EAS Treasurer and Membership Chairman Don Stone no longer maintains an office at Chabot Observatory, and so all correspondence that relates to these aspects of EAS affairs must be directed to Don at 5119-B Ray Avenue, Castro Valley, CA 94546-2511. His new e-mail address is ddcstone@earthlink.net.

To contact Don by telephone, please call (510) 733-6738. He asks that when you call, let the phone ring until the answering machine or Don himself responds. He sometimes needs extra time to get to the telephone.



DATELINE OCTOBER

- 5 1882 Robert Goddard, born
- 1 1897 Yerkes Observatory, University of Chicago,
largest refractor, 40 inches
- 14 1947 First supersonic flight, Chuck Yeager
- 4 1957 Soviet Sputnik 1, first artificial satellite
- 1 1958 NASA established
- 6 1997 Cassini launched

- 5 1998 Full Moon, 07:12 PDT - 20:12 UT
- 12 1998 Last Quarter Moon, 04:12 PDT = 11:12 UT
- 20 1998 New Moon, 03:10 PDT = 10:10 UT
- 25 1998 Standard time returns, 01:00 PDT = 01:00 PST
- 28 1998 First Quarter Moon, 03:47 PST = 11:47 UT

Chabot Observatory Programs • October

Telescopes are open for viewing from 8:00 PM until 10:30 PM on Friday and Saturday evenings, except October 23 and 31. For reservations, phone (510) 530-3480 x36

- October 9 and 10 The Liquid Nitrogen Show
 The Sky Tonight in the Planetarium
- October 23 MoonDazzle • At Cal-State Hayward
- October 24 and 30 An Evening on Jupiter and Saturn
 The Sky Tonight in the Planetarium

FUTURE CONJUNCTIONS

October

- 8 7:30 PM EAS Board meeting
- 10 5:00 PM EAS meeting
 Picnic and Site Inspection at the
 New Chabot Observatory & Science
 Center, with Dr. Mike Reynolds
- 16-17 Starry Nights Festival, Yucca Valley
- 23 5:00 PM *MoonDazzle*, Cal-State Hayward

November

- 7 10:00 AM NCHALADA, Chabot
 1. Ole Roemer 2. Horizon Markers
 in Archaeoastronomy
- 7 7:31 PM EAS lecture meeting
- 12 7:30 PM EAS Board meeting
- 17. *Cruise to the Cosmos*, COSC

✓ Check our our Web Sites at:

<http://silcon.com/~eas>

<http://chabot.cosc.org/~eas>

If you have photos you would like to have displayed on our Web page, please submit a .gif file, .jpg file or a color print to the editor, Ellis Myers Phone (925) 284-4103. We would be happy to include your work.



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