



The Refractor

The Bulletin of the Eastbay Astronomical Society

Founded in 1924 at Chabot Observatory, Oakland, California

Volume 75
Number 11
July 1999

Leonid Meteors: Up Close and Personal

Saturday, 3 July, 1999

- General Meeting - 7:31 pm
- Lecture - 8:20 pm

Chabot Observatory

4917 Mountain Boulevard, Oakland

Dr. Peter Jenniskens

Ames Research Center, NASA
and SETI Institute

The Leonids, in mid-November, are one of the best and most reliable of meteor showers, usually having a rate of about 20 meteors per hour. This meteor shower results from Earth's encounter each year with clouds of particles left behind by comet Tempel-Tuttle. Tempel-Tuttle's orbital period is 33 years. When the comet is near perihelion the abundance of cometary debris along its orbit is greatly higher and the observed meteor rate is greatly enhanced. In 1966 there were an incredible 150,000 meteors per hour, 7000 times the normal shower flux!

[1966 + 33 = 1999]

Leonid meteors are very fast, with typical velocities of 70 km per second, thus, spacecraft can be struck on trailing edges. The reason for this is that particles from Comet Tempel-Tuttle move in a retrograde orbit about the Sun, so the Earth collides with them "head on." The possibility of a meteor storm may delay any shuttle flights scheduled for mid-November of 1999 and 2000.

Astronomer Peter Jenniskens is a Research Scientist with the SETI Institute and works at NASA/Ames Research Center on topics that relate to interstellar and interplanetary matter. His work at the Space Science Electron Microscopy Lab has led to the discovery that unusual forms of water ice play an important role in astrophysics. He is an experienced meteor observer and passionate about studies of interplanetary matter as it manifests itself in the level of meteor activity in the sky. Amateur meteor observers worldwide have participated in his studies of meteor outbursts, brief enhancements of meteor rates that stand out above the normal annual meteor activity.

Jenniskens' current research on meteor stream activity focuses on meteor outbursts, related to the ejection of particles from cometary ices. This research started as a hobby, while a member of the Dutch Meteor Society, and has developed into a



Some Leonid meteors are so bright that they may be seen in the daytime, as in this photo taken by Yan On Sheung on November 16, 1998, at 2200 UT (6 AM), from Hong Kong. Leonids include many very bright meteors, often leaving trails that last for many seconds.

professional activity funded by NASA. In April, 1990, Peter Jenniskens led research into the Glanerbrug meteorite fall in the Netherlands and, in August, 1992, the Mbale meteorite in Uganda. During the Mbale fall, a young boy was hit by a small meteorite in a meteorite shower.

Peter Jenniskens is a member of IAU Commission 22 (chair of the professional-amateur cooperation working group), the AAAS, the Meteoritical Society, the AGU, the Faraday Society, the Astronomical Society of the Pacific, the Dutch Meteor Society, and the Dutch Astronomers Club.

It's not too early to plan for this exciting event, just four months in front of us. Your first step is to come to the July 3 meeting of the Eastbay Astronomical Society and hear about meteor showers in general, and the Leonids in particular, from one of the world's preeminent students of this phenomenon. Celebrate Independence Day with a new understanding of nature's own fireworks. Your next opportunity will be in 2032!

DINNER WITH THE SPEAKER

5:27 PM, Saturday, 3 July 1999

PEARL OF SIAM

5498 College Avenue, Oakland (510) 420-8600

Please call Betty Neall at 510 / 533-2394 by Friday, 2 July to confirm your place. Please note the time has been advanced to allow everyone to be able to get to the meeting promptly at 7:31 PM.



Sagittarius, the Archer

is a prominent constellation of summer skies. While many people these days think of a teapot, in classical times this was Chiron, the wisest of all the centaurs—half man, half horse—who were archers. In other traditions, Persian, Turkish, Hebrew, Hindu, and Babylonian, the constellation is also associated with a bow and arrow. The Greek story is about the only one of the creatures who was kind and good—all the others were rude and unruly ne'er-do-wells. In fact, Chiron had been taught by Apollo and Diana, and he was skilled in music, hunting and medicine. It was he who invented the constellations and showed the Argonauts how to use them as guides in their quest for the Golden Fleece. Chiron was immortal, but he was accidentally wounded by Hercules with an arrow that had been dipped in the blood of Hydra. Although this did not kill him, it caused him continual agony and he cried out to Jove to let him die like any mortal. His request was granted and after his death, Chiron was placed in the sky where he could always be a guide to mariners.

The Pima and Maricopa of the American Southwest tell a story of Coyote and his twin brother, Fox, sons of the Sun and the Moon. Like Coyote throughout Native American culture, Fox was a trickster. One day, intent on some sort of prank, he was running along the Milky Way when he fell off and became six stars now seen as what some call the Milk Dipper. These six stars are outlined as a smaller twin of Coyote, the Big Dipper. They are the stars that form the handle and dome of the teapot asterism, together with another star, the quadruple μ Sagittarii.

There are other nice multiple stars in the constellation, including ζ , η and π Sagittarii. There are 15 Messier objects as well, including the Lagoon Nebula (M 8), the Horseshoe Nebula (M 17), and the Trifid Nebula (M 20). There are twelve Messier clusters, too; one of them is M 21 which can be seen in Conrad Jung's photo just above and left of the Trifid. M 22 has been called the finest globular cluster, after M 13, visible to northern-latitude observers. Its stars are of tenth magnitude or fainter, but they are so compact that they form an object that may just be visible to the naked eye. Quite a few other clusters, not listed by Messier, are in this rich region of the sky.

The center of our galaxy lies just within the boundary of Sagittarius with Scorpius, to the west of the tip of the teapot's spout. Studies show a massive cluster of stars and swirling gas, more than 30,000 light years distant from us, where it is conjectured that there may be a black hole.

A recent newcomer to the stars of Sagittarius was discovered in April of this year by a Japanese observer, Minoru Yamamoto. Originally reported at magnitude 8, the nova V4444 Sagittarii had dropped in brightness to magnitude 13 by mid-June.



The Trifid Nebula consists of both a reflection and an emission nebula. In the southern part, hot, young stars have excited hydrogen atoms in the surrounding gas, which then glows, emitting red light. To the north, cooler starlight is reflected by a myriad of dust particles, resulting in a blue glow. Unfortunately, black ink does not truly represent the magnificence of this object. Charles Messier's M20, the Trifid gets its name because dark lanes break the cosmic cloud into three major parts. This photo was taken from Fremont Peak by Conrad Jung, using a 10-inch 1/4 newtonian reflector. The image was made by stacking two Kodak Pro400 negatives each exposed for 30-minutes.

Points of Light

By Mark Gingrich

We've recently learned of several EAS members who are actively involved with the Astronomical Society of the Pacific's *Project Astro*, a partnership between astronomers—both amateur and professional—and 4th-9th grade teachers: **David Anderson, Celeste Burrows, Nancy Cox, Alan Gould, George Johnston, Gary Linford, Amella Marshall, Tinka Ross, Deborah Scherrer, Lance Shaw, and Bill Stepka.**

(Have we omitted anyone?)

Deborah Scherrer earned an Astronomical League Messier Certificate for successfully observing all 110 objects from Charles Messier's famous list.

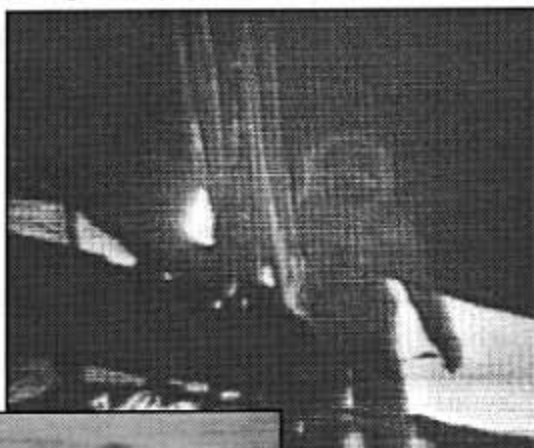
The June *Sky & Telescope* features a fine color image of M51, the Whirlpool Galaxy, taken by **Robert S. Hoyle.**

HERE MEN FROM THE PLANET EARTH
FIRST SET FOOT UPON THE MOON
JULY 1969, A.D.
WE CAME IN PEACE FOR ALL MANKIND

Moonfest Celebrates Apollo 11

Mark your calendars for July 16 through July 24, 1999. "Moonfest" will be held on board the aircraft carrier USS Hornet at the former Naval Air Station in Alameda to celebrate the 30th anniversary of Apollo 11. There will be a ceremony on July 24 to commemorate the day the crew of the Hornet picked up Apollo 11 after its splashdown in the Pacific. The Hornet was the prime recovery ship for both Apollos 11 and 12 in 1969. The ship was decommissioned a few months after Apollo 12 and is now a floating museum with permanent displays on the role of the ship from its service in World War II until its decommissioning.

Buzz Aldrin will be a distinguished guest, and several of the other Apollo astronauts may also be there. There is a very real possibility that Neil Armstrong will also be there for the 24th. NASA is providing a display of Apollo items including a Moon rock and spacesuit. In addition to Moon-related displays and events,



Neil Armstrong's small step, above, and one of the USS Hornet's shining moments, left. These photos of the Apollo 11 mission were taken from a live television screen by Refractor Editor Ellis Myers.

tours of the ship will also be given. Talks on space and the Moon will be given during the celebration period. Companies, publishers, and government agencies involved in space and astronomy will have display booths.

Star parties are planned for the evenings of July 23 and 24. Telescopes will be set up either on the flight deck or on the pier near the ship. Actual site for the star party will be determined later. Amateur astronomers are asked to please bring your scope to the star party and share the night sky and waxing gibbous Moon with the public. Please coordinate your participation in this historic happening with Carter Roberts.

For the latest details on the time of daily events and additional information on Moonfest, check the Moonfest web site at <http://www.usshornetmuseum.org> or call (510) 521-8448.

Chabot on the Go

By Marcia Hale

Manager, Volunteer Services



To help create for Chabot a first-class volunteer program unlike any other volunteer opportunity in the Bay Area, I'm sure you'll find a way to become and stay involved whether you have a few hours a month or a few hours a week to share!

This summer we plan to take "Chabot on the Go." This traveling program previews the fun, interactive type of activities visitors will find at the new Chabot, plus it gives people the opportunity to hear about our wonderful project and perhaps become members. Volunteers will take the program to venues throughout the East Bay. Training on interactive learning styles and the science content of the activities will be held soon.

It looks like our first opportunity to take "Chabot on the Go" will be the weekends of July 16-18 and 23-25 as part of the "Moonfest" celebration aboard the historic USS Hornet at Alameda. We'll need teams of volunteers to support our interactive tables offering a variety of space-related activities, and on our membership and information table. This would be additional to the Eastbay Astronomical Society's participation in bringing telescopes and expertise to the event.

Plus our summer classes need classroom aides. If you love working with elementary-age children and are available weekdays, we can use your help. It's great fun, you may find yourself wondering who is learning more—you or the kids! Please respond without delay, as classes begin the end of June.

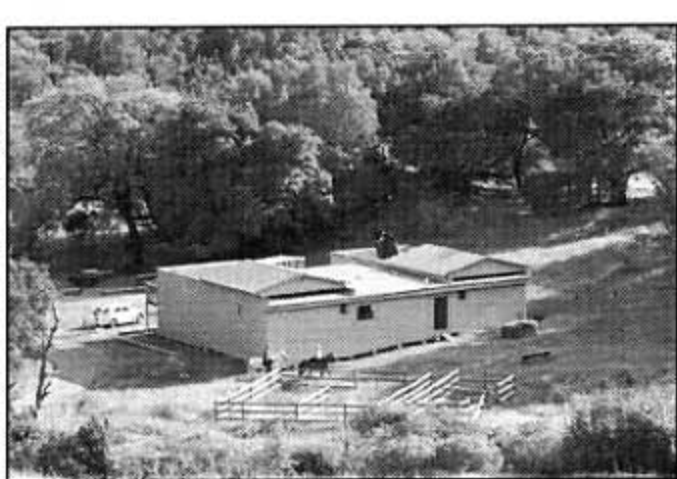
All summer long we'll be offering "Hard Hat Breakfasts" and "Sunset Tours" to our donors and interested citizens. These events are held once a month and last two to three hours. Volunteers are needed to greet our guests and help us with set up and take down. And you'll get a site tour whenever we have room available.

Training and orientation to all that's new at Chabot will be scheduled soon. We've got lots of ways to involve you, so if you've been waiting for things to get under way, your wait is over. We've launched the volunteer program and are ready to go into orbit with a whole list of activities. Let us know if you want to

help create an excitement for astronomy and space in the minds of our community, particularly for our youth. Please call me at 510-530-3480, extension 26; or e-mail at mhale@cosc.org. I look forward to meeting you.

Carolyn Shoemaker Honored

USGS volunteer Carolyn Shoemaker was honored by Australian geologist Andrew Glikson, who named a geologic discovery after her. A 25 to 50 million-year-old crater field at the bottom of the Timor Sea, southwest of Darwin, resembles the July 1994 impact on Jupiter of the Shoemaker-Levy-9 comet that was co-discovered by Carolyn, her late husband, USGS scientist emeritus Gene Shoemaker, and David Levy. This pre-historic impact on Earth left a swath of 43 craters.



Ferguson Observatory Opens

At Sugarloaf Ridge State Park in Sonoma County, the Valley of the Moon Observatory Association held a Grand Opening party on June 19 to celebrate the completion of Phase 2 of their Ferguson Observatory. Just a year ago, George Loyer, president of VMOA, spoke to the Eastbay Astronomical Society, outlining this program, named to honor Bob Ferguson. Ferguson was a dedicated amateur astronomer who originated the "Striking Sparks" idea of making small telescopes and giving them to local youth to spark their enthusiasm for astronomy.

The completion of the building, and the installation of a 14-inch Newtonian telescope equipped with a CCD-imaging camera marks a turning point for the association. The facilities are ready for use to enlighten kids and adults in the area, and to provide a place where they can explore their dreams.

The opening ceremonies were attended by about a hundred people, who toured the building, listened to several talks, feasted on barbecued hot dogs, and, after dark, watched the stars in a clear sky. During the afternoon, telescopes were trained on solar prominences. EAS member Leonard Higgins brought his award-winning spectroheliograph, which you may have seen at the Riverside Telescope Makers Conference.



Inside the Phase 2 observatory wing, the new 14-inch telescope was on display. It had seen "first light" during the previous week. Illustrated here is one of the first images Phil Sullivan secured with this equipment. It is an image of M 101 in Ursa Major, comprising eleven unguided 2-minute exposures, stacked.

Also featured is a scale model "Planet Walk" along State Park trails, with plaques describing the relative size of each planet. Earth is shown at a diameter of about 5 millimeters; the Sun is across the parking lot; Venus is near the picnic tables.

Comet Comments *By Don Machholz*

Many new faint comets have been discovered in the past few weeks, nearly all by automated equipment designed to find near-earth asteroids and comets. Meanwhile, Comet Lee swings into our morning sky while Comet LINEAR (1998 T1) and Periodic Comet Tempel 2 pass through opposition.

The LINEAR program in New Mexico has found eight more comets, all faint and some with large perihelion distances. Lowell Observatory's LONEOS program found two, one named for Brian Skiff and one for Bill Ferris. The SOHO satellite discovered three sungrazer comets headed into the Sun.

Comet Hunting Notes: Steve Lee's discovery in April was the third accidental find of the past six Southern Hemisphere visual comet discoveries. That is a high percentage considering that there are only two other accidental finds among the 80 visually found since 1975. What does this mean? If the comets were outside typical comet hunting areas, then comet hunters would tend to miss them. For two of the comets this may be true, as the discovery elongations were 72, 103, and 120 degrees from the Sun. And if the comets brighten rapidly before discovery, then the usual comet hunting methods may miss them. A third reason for more accidental finds is an increase of activity among non-comet hunters. With the Internet making it easier to report suspicious objects, and the Wilson award motivating the reporting of new comets, accidental comet discoveries by amateurs may continue at a brisk rate in the Southern Hemisphere, which is not covered well by the automated search programs.

Date (UT)	R.A. (2000)	Dec.	Elong.	Sky	Mag.
C/1999 H1 (Lee) [Cancer-Gemini]					
06-26	08h12.3m	+21°51'	27°	E	6.9
07-01	08h07.5m	+24°22'	21°	E	6.7
07-06	08h02.3m	+26°42'	15°	E	6.7
07-11	07h56.7m	+28°52'	11°	E	6.7
07-16	07h50.6m	+30°55'	10°	E	6.7
07-21	07h44.2m	+32°52'	13°	M	6.9
07-26	07h37.6m	+34°44'	18°	M	7.0
07-31	07h30.6m	+36°33'	24°	M	7.2
C/1998 T1 (LINEAR) [Microscopium-Hydra]					
06-26	21h27.6m	-35°32'	137°	M	9.2
07-01	19h57.8m	-44°36'	153°	M	9.0
07-06	17h54.3m	-47°47'	152°	E	9.0
07-11	16h12.9m	-43°42'	136°	E	8.3
07-16	15h13.5m	-37°47'	121°	E	8.8
07-21	14h40.0m	-32°51'	109°	E	9.2
07-26	14h20.0m	-29°10'	100°	E	9.7
07-31	14h07.5m	-26°28'	91°	E	10.0
Periodic Comet Tempel 2 (P/55) [Ophiuchus]					
06-26	17h09.2m	-07°26'	157°	E	10.9
07-01	17h05.8m	-08°33'	153°	E	10.8
07-06	17h03.1m	-09°50'	150°	E	10.7
07-11	17h01.1m	-11°15'	145°	E	10.6
07-16	17h00.2m	-12°46'	141°	E	10.6
07-21	17h00.3m	-14°22'	137°	E	10.5
07-26	17h01.7m	-16°00'	133°	E	10.5
07-31	17h04.3m	-17°40'	129°	E	10.5

Roberts Rules

By Carter Roberts

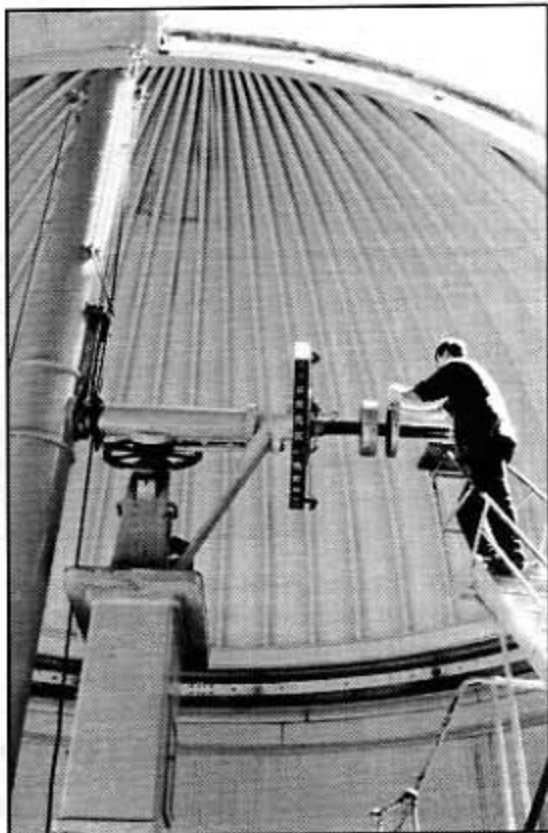
Summer is here, and summer is the time for stargazing. Of course, Fall, Winter and Spring are times for stargazing, too, but that's not the point. The point is that you have no excuse for not enjoying the beautiful weather that lures you to places, such as the Sierra, where skies are dark. There, constellations remind you of ancient times when people had no *Star Wars* to excite their imaginations of weird monsters—they had instead centaurs, winged horses, unicorns, and giant heroes, all on their original, unexcelled IMAX dome overhead.

So take advantage of your opportunities. First, there is the trip that Dave Rodrigues plans each year. Then there's the 30th anniversary of the Apollo 11 mission. Please plan to attend the party aboard the USS Hornet, and if you can, bring a telescope. Call me about this! We'll also need your help at the annual star party we host, along with the East Bay Regional Parks. This event will be on Wednesday, August 18, at Bort Meadow. It's always satisfying to share the stars with the kids. And don't forget your back yard as a viewing spot with binoculars—the Perseids become active in late July and will peak about August 12 in a moonless sky. The lunar eclipse on the early morning of July 28 is another time to have the lounge



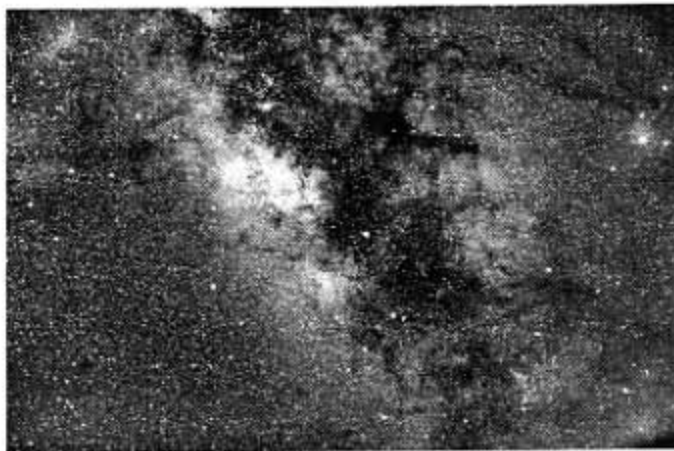
chair and the hot chocolate ready. You may see some Delta Aquarid meteors then, too.

There are lots of ways to watch the stars, but not right now through *Rachel*, COSC's 20-inch refractor. As seen in these pictures, *Rachel* is undergoing refurbishing en route to her new home. The telescope itself was to have been removed from the dome on June 24. It will be cleaned and repainted, then installed at the new site, likely in October. The optics will also be cleaned and aligned. Mike Reynolds, Kevin Medlock and Bob Schalk (l-r) are shown here preparing the lens for shipment. Kevin Medlock is the one dismantling the instrument, which had been in place since 1915.



Barcroft Star Party

There may be a few spaces remaining for the *legendary* astronomical high at the Shangri-la of the White Mountains from July 8-12. You've read about this star party in previous issues of the *Refractor*, so now just call up Dave Rodrigues before it's too late. Phone (510) 483-9191. You, too, can take astrophotos such as this one Axel Mellinger took in 1997. It's a view of Sagittarius and Scorpius; the teapot asterism is in the left center. Do it!



Eastbay Astronomical Society

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Articles and photos for *The Refractor* are encouraged. Deadline for the August issue is July 30, 1999. Items may be submitted by mail to the editor, Ellis Myers, 215 Calle La Mesa, Moraga, CA 94556. Internet e-mail address: eas@silcon.com. For further information please call (925) 284-4103.

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

DATELINE JULY

- 4 1054 Chinese record Crab Nebula supernova
6 1687 Isaac Newton published *Principia*
18 1921 John Glenn, born Cambridge, Ohio
20 1969 First Moon landing, Apollo 11,
Neil Armstrong and Edwin Aldrin, with
Michael Collins
20 1976 Viking 1 landed on Mars
6 1999 Last Quarter Moon, 04:57 PDT
12 1999 New Moon, 19:24 PDT = 02:24 UT 13 July
17 1999 First Quarter Moon, 01:59 PDT = 08:59 UT
28 1999 Full Moon, 04:25 PDT = 11:25 UT
Partial eclipse of Moon

Join the Eastbay Astronomical Society!

Call Don Stone, EAS Membership Registrar, (510) 733-6738
or e-mail ddcstone@earthlink.net
5119B Ray Ave., Castro Valley, CA 94546-2511
Regular membership, \$20 per year; Family membership, \$30 per year
Sky & Telescope and Astronomy magazine subscriptions at discount.

Eastbay Astronomical Society lecture meetings will
be presented on July 3, then on the third Saturday of
each month until the end of the year.

August 21, September 18, October 16
November 20, December 18

FUTURE CONJUNCTIONS

July

- 3 7:31 PM EAS Meeting, Dr. Peter Jenniskens
Leonid Meteors: Up Close
15 7:30 PM EAS Board meeting, Chabot
16-24 Apollo 11 Celebration, USS Hornet

August

- 18 Star Party at Bort Meadow
19 7:30 PM EAS Board meeting, Chabot
21 7:31 PM EAS Meeting
28 10:00 AM NCHALADA

Chabot Observatory Programs - July

Highlights of the 1999 Meteor Showers

Friday and Saturday evenings, July 9, 10, 23, 24
For show reservations, phone (510) 530-3480 x36

Take a look at the Perseid, Leonid and Geminid Meteor Showers occurring
in 1999 plus details on viewing prospects. *The Sky Tonight* follows in the
planetarium. Admission is \$5.00 for adults, \$4.50 for seniors, \$3.50 for
children 6-17. Chabot Observatory & Science Center members are
admitted free. EAS members are admitted free if space available. The
show begins at 7:30.

The Chabot 8-inch Alvan Clark telescope is open for free public viewing
on most Friday and Saturday evenings. The 20-inch telescope is not in
service at this time.



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