The Refractor

The Bulletin of the Eastbay Astronomical Society

Founded in 1924 at Chabot Observatory, Oakland, California

Volume 74
Number 2
October 1997

Maria Mitchell:
First Woman of American Astronomy

Saturday, 11 October, 7:31 p.m.

Chabot Observatory
4917 Mountain Boulevard, Oakland

October 1, 1997 will mark the 150th anniversary of the discovery, by Maria Mitchell, of the first telescopic comet ever discovered, by either a man or a woman. On Saturday, October 11, EAS will have a special and unusual program: a theatrical portrayal of the life and times of Maria Mitchell. Dramatic readings and historical enactments will feature Michelle and Rebecca Orengo-McFarlane of the teen theater group *Comet Players*. The presentation will be introduced by Lawrence Hall of Science's John Hewitt, a member of EAS.

The eye that directs the needle in the delicate meshes of embroidery will equally well bisect a star with the spider web of the micrometer.
Maria Mitchell

Maria Mitchell was America's first well-known female astronomer. She learned the sky from her father, who taught celestial navigation to whaling ship captains in their native Nantucket. On October 1, 1847, while her parents entertained guests downstairs, she discovered a comet which she promptly announced to her parents and guests. For this discovery she was awarded a gold medal by the King of Denmark, which he had offered sixteen years earlier to the first person to find a comet that was not visible to the naked eye at the time of discovery.

As a result of her discovery and the subsequent award, Mitchell became famous as a woman astronomer. One of the first woman scientists in the U.S., she was the first woman elected to the American Association for the Advancement of Science—it was 95 years later that the second was elected. Later, she helped found the Association for the Advancement of

Continued on page 3

Join us for

DINNER WITH THE PLAYERS

5:28 p.m., Saturday, 11 October, 1997

PEARL OF SIAM RESTAURANT

5498 College Avenue, Oakland (510) 420-8600

Please call Betty Neall at 510 / 533-2394 by Friday, 10 October to confirm your place. Please be on time to allow ample time for dinner and to facilitate a prompt meeting time of 7:31 p.m.

The Maria Mitchell Association

is offering an annual award to honor an individual or organization that encourages girls and women to pursue studies and careers in science and technology.

It is named for Maria Mitchell (1818-1889), first professional woman astronomer and first woman astronomy professor in the U.S. The Maria Mitchell Association believes that the most important legacy Maria Mitchell left was the vision and quality of education she gave to her students. The generations of women she trained during her 23 years at Vassar College went on to make an enduring contribution to the progress of women in all fields of science. Teacher, mentor, role-model—Maria Mitchell epitomized the full measure of what a woman scientist could be, and were she with us today, her remarkable energies would surely be focused on academic reform and career advancement opportunities for women in science.

While there are already many awards for scholarly and professional achievement in the various fields of science, the Maria Mitchell Association believes it is equally important to recognize the people and organizations whose influence and support make it possible for women to achieve those accomplishments. Therefore, the goal is to recognize an individual or organization that encourages girls and women to pursue studies and careers in science. It is not an award for individual achievement in these areas, but rather for helping to create conditions that make achievement possible.

The award, in the amount of $5000, will be given annually beginning in 1997. It will be presented the first weekend after October 1, the anniversary of Maria Mitchell's comet discovery that made her internationally famous. The first award will be presented on October 4, 1997 at the Great Hall of the Nantucket Atheneum. It will honor several people who encouraged girls and women through their work at the Maria Mitchell Association. 1997 awardees are Henry Albers, Edith Andrews, Dorrit Hoffleit and Eileen McGrath.

Beginning in 1998, the award winner will be selected from nominations in a national juried competition. Nominations will be accepted beginning in January 1998. For more information, please contact the Maria Mitchell Association at 508-228-9198. Mailing address: 2 Vestal Street, Nantucket, MA 02554; e-mail: mara.alper@mmo.org

Capricornus, not Capricorn

is the name of the Zodiac constellation that can be found low in the south during evenings in autumn. Astrologers may call it Capricorn, but astronomers do not. Astrology was a way of life, though, until the times when men were able to use more than just their imaginations to study the heavens. And after all, you can call any group of stars anything you like; you can even pay to have stars named whatever you want, and for your money they will put your name in a book in a bank vault in Switzerland, or whatever they say they'll do. None of these star-naming schemes is official, however, and the names won't be known to any astronomers. Think carefully before you pay your money, but this is usually an honest way for some people—even legitimate astronomy groups—to sell their imagination.

When, thousands of years ago, the ancient peoples of Babylon and Chaldea looked to a certain portion of the sky they imagined it as akin to the sea. Without many bright stars that region seemed vast as the oceans, stretching beyond their view. The fascination with the sea led to sky stories of wondrous creatures such as the goat-fish that later became the symbol of Capricornus.

Some say the symbolism came from India, where the stars of Aquarius were the first of their zodiac. Its patron god was Varuna, the all-powerful lord of the sky and creator of the stars. He rode through his starry realm on Makara, his fabulous steed, half crocodile and half bird, who was equally adept on the sea as in the air. As Varuna, represented by Aquarius, eventually lost his claim to the sky and became just the god of the oceans, so Makara, represented by Capricornus, also lost his identity and became half fish and half ibex, or wild goat [*Capra ibex*]. The name Capricornus actually means 'horned goat' in Latin.

Sargon, a Babylonian founder of about 2800 BC, left records foretelling the fiery destruction of the world should all the five planets appear at the same time in the sign of Capricornus. Such an event actually occurred, according to Chinese astronomers, in the year 2449 BC. No blazing conflagration was reported.

October is a fine month for observing Capricornus, for Jupiter shines there this month. Find what appears to be a wide arrowhead, pointed downward, by following to the south and east the line of the three bright stars in Aquila.

Capricornus places second to Cancer among the zodiac constellations in faintness. No stars are brighter than third magnitude. The brightest star in the constellation is Deneb Algedi, from the Arabian for 'tail of the goat.' Its magnitude is 3.1. About equally bright at 3.2 is Algedi, Alpha Capricorni. This is an optical naked-eye double; the brighter, Alpha-2, is 100 light-years distant, with Alpha-1 about 500 light-years away. The chance alignment places them just over six minutes apart along our line of sight. Each of these stars is multiple. These stars were studied in 1862 by the renowned telescope maker Alvan G. Clark, whose firm made Chabot's 8-inch refractor in 1883 to the order of founder Anthony Chabot. In 1913 this magnificent telescope was given the name *Leah* by Chabot Observatory Director Charles Burckhalter.

There are few deep-sky objects of note for small telescopes. M30 is the only Messier object, a globular cluster of magnitude about 7.5 and with a diameter of eleven minutes. Messier discovered the faint cluster in 1764, using a small reflecting telescope of aperture equivalent to two inches. Concluding it to be a nebula, he could not resolve the fuzzy patch into stars; and it was left for Sir William Herschel with his far better optics 19 years later to describe the cluster in detail. The cluster has been found to be about 40,000 light-years away.

NGC 6907 is a barred spiral seen nearly face-on. It is just a fuzzy spot (mag. 11.3) in a small telescope. Image courtesy of Steven Williams, Grove Creek Observatory in Australia. <www.gco.org.au>

The discovery of the planet Neptune is one of the more interesting tales of modern astronomy. Following the discovery in 1781 of Uranus, Herschel's 'George's Star,' the new planet was found to have an uneven motion. Speculation suggested that yet undiscovered planet was perturbing the orbit in a minute but 'intolerable' way. John Couch Adams, an undergraduate at Cambridge, undertook the problem and in 1845, after two years of calculations, sent a prediction of the location of a ninth planet to Astronomer Royal Sir George Airy. Nothing was done to follow up Adams's work. Meanwhile, Urbain J. J. Leverrier in France independently solved his equations and sent his solution to Johann Galle in Berlin. Galle immediately pointed his telescope to the predicted position. With the help of a graduate student, Heinrich d'Arrest, he found an eighth-magnitude 'star' that was not on the best available star map. On closer observation Galle discerned the object to have a small disk. The planet was within a degree of Leverrier's prediction in Capricornus, near Deneb Algedi. Joyously, Leverrier suggested that the planet be called *Leverrier*. His second choice, *Neptune*, was adopted instead. It seems a fitting name for a planet that appears sea-blue in color, and which was first imagined to exist—and then was discovered—in a constellation of the sea.

Betty Neall Becomes a Nonagenarian

By Mark Gingrich

On September 23rd, one day after the autumnal equinox, the esteemed Betty Neall completed her 90th orbit of the Sun. September lecture meeting attendees sang "Happy Birthday" and enjoyed a cake prepared for the occasion.

Now well into her seventh decade as an EAS member in good standing, Betty was born during Teddy Roosevelt's tenure as U.S. President. It was a time when San Francisco was busily rebuilding itself after a devastating quake and fire, when Percival Lowell stubbornly insisted that the Martian canals were real, when the solar system had only eight known planets, and when M31, the Great Spiral Galaxy in Andromeda, was thought to be a mere gas cloud within the Milky Way confines.

So much has changed since. During Ms. Neall's lifetime Halley's Comet passed through perihelion—twice! And given her faithful attendance record, we conservatively estimate that she's been witness to at least 500 Society lecture meetings, through which she has met Albert Einstein, Walter Baade, and Otto Struve, to name a few.

But what truly distinguishes Betty from the rest is her special view of the Society: It's no secret that she considers the EAS members to be her immediate family.

We feel the same about you, Betty. May you have many more birthdays to come.

Roberts Rules

By Carter Roberts

Pack a picnic and participate in a Star Party and Celestial Celebration called MoonDazzle II (without the Moon). This event will be held at Cal State Hayward on Thursday, October 30, and looks to be a dazzling evening that combines music and science. Featuring the music of Dave Eshelman and the CSUH Jazz Ensemble coupled with the astronomy guidance of Dr. Gary Weston of CalState's Physics Department and our own Dr. Mike Reynolds, this is a gathering that merits a bold circle on your calendar. But, more than that, EAS needs to help with putting on the show. We need to supply people and telescopes to make the event a complete one for those who will attend this star party. Conrad Jung is the one to talk to about joining the fun and, in light of the EAS principle of bringing astronomy to the community, showing others what's up.

Oakland's Festival at the Lake is another opportunity for you to get out into the world and have a good time, plus helping to spread the word about activities of Chabot Observatory and Science Center. As we did recently at the Chinatown StreetFest, EAS will assist COSC with a booth, where we will set up solar viewing and be available to answer questions. If you can come for any portion of the day, please contact me or Don Stone for more information or to check schedules. The dates are Saturday and Sunday, October 11 and 12, each day from 10 a.m. to 6 p.m.

Do not fail to renew for the coming membership year, which runs from November 1 through October. If you have questions about dues or subscriptions to *Astronomy* or *Sky&Telescope*, please get in touch with EAS Treasurer, Don Stone

Maria Mitchell *Continued from page 1*

Women. She worked as a computer (mathematical calculator) for the American Ephemeris and Nautical Almanac.

When Vassar College opened in 1865, Mitchell, despite her lack of formal education, was asked to become the director of the college observatory. From 1865 to 1888, she trained several generations of women in rigorous scientific thought. While at Vassar, her observations of Jupiter convinced her that Jupiter was not a solid planet covered by a thin layer of clouds, as was commonly thought at the time, but that all that could be viewed was clouds.

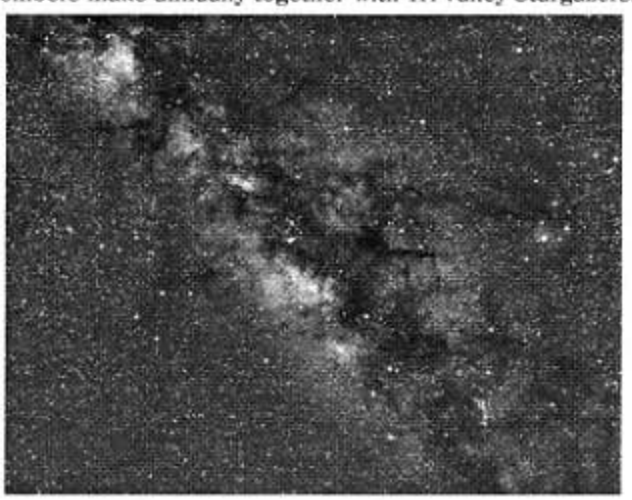
In addition to the dramatic presentation on October 11 all attendees will get to make their own comet using an unusual recipe (*not* the project Astro recipe!). There will be other activities as well as information for educators on sources for comet and comet-related activities. Please join us for what should be a very different EAS meeting!

[This introduction was written by Program Director Dave Rodrigues with contributions from Geoff Marcy.]

Don Davis, Space Artist

will be the speaker at the November meeting of the Eastbay Astronomical Society. Davis's work includes the cover of the October issue of *Sky&Telescope*, which is a digital collage of images to suggest the scene on Mars of Pathfinder together with Sojourner. Come on Saturday, November 8, at Chabot.

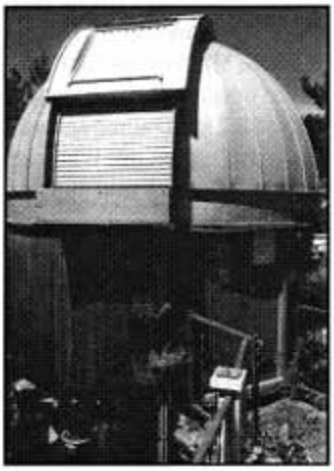
Then on December 13 we will hear from David Cudaback, Professor of Astronomy at the University of California, Berkeley. Dr. Cudaback is a former Director of the University's White Mountain Research Station. Barcroft Laboratory at 12,400 ft. elevation is the site for the astrophotography expeditions EAS members make annually together with Tri-Valley Stargazers.



Axel Mellinger took this image of the Milky Way in Scorpius and Sagittarius from Barcroft Laboratory on July 5, 1997.

No one else would be more qualified to talk about the rigors and advantages of observing from high altitude venues than Dr. Cudaback. The paucity of oxygen is great for providing clear observing, but must be accounted for in merely being there. Called the Astronomer's Disease, mountain sickness is a real concern even if you are only visiting one of the high-altitude observatories such as Moana Kea or Mount Graham.

Observatory Equipment



from the estate of former EAS member Quentin E. Fritzsche is being offered for sale. Mr. Fritzsche died in February of this year, at the age of 88. With his main interest in viewing the Sun and recording solar events, his instruments and his observatory were maintained to high standards.

The complete observatory, in Napa, has a ten-foot diameter Ash dome with Lanphier shutter system. The dome and shutter rotation have variable-speed electric motor control. It has air conditioning and humidity control and is currently set up for a Celestron C-14 telescope. The observatory, with built-in cabinets and audio system speakers, is valued at $16000, and the asking price is $12000. The Celestron C-14 is priced for sale at $8000 (list price is in excess of $18000).

Other items include DayStar filters, eyepieces, clocks, video cameras, telescopes, eyepieces and filters, audio equipment, books, and miscellaneous tools. Asking prices for individual items are generally not more than half of approximate list prices, and range as low as a dollar or less. To inquire about the list of available items, call Leonard Higgins at (707) 252-9110.

Our Place in the Universe

is a "zoom" discovery tour of our universe in seven steps: from the Earth to the solar system, the local starry neighborhood, the Milky Way galaxy, the local group of galaxies, the Virgo super cluster of galaxies, and finally the known Universe. A short tour of the constellations of the fall sky will follow the theater presentation in the Chabot-Rotary Planetarium. October 3 through November 22. (510) 530-3480 ×36 for reservations. EAS members admitted free on a space-available basis.

Eastbay Astronomical Society

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Vice President:	Phil Crabbe II	(510) 655-4772
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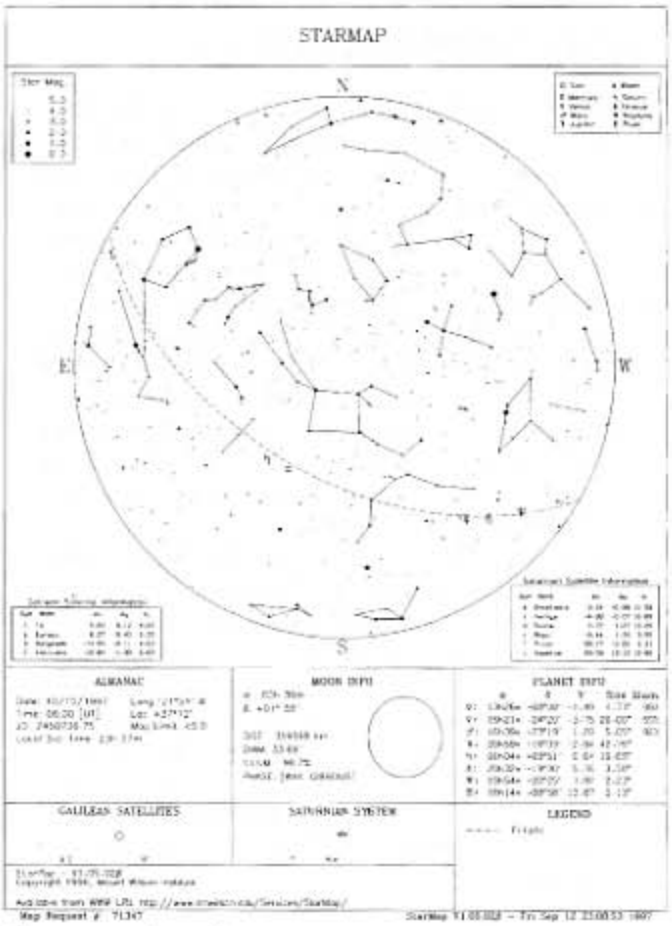
Immediate Past President:	Betty Neall, *ex officio*	(510) 533-2394

Articles and photos for *The Refractor* are encouraged. Deadline for the November issue is October 22, 1997. 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 (510) 284-4103.

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



From the Internet

you can download a star map made to order for your location and for any date you choose. The Mount Wilson Institute maintains this free service at the address http://www.mtwilson.edu/Services/StarMap/. The map will include constellation patterns and location of the eight planets and the Moon. In addition, almanac data are listed to give information about the Moon's phase as well as positions and magnitudes of both the Galilean and Saturnian satellites.You can set the limiting magnitude of the stars to be displayed. The illustration here is for Lick Observatory, October 14, 1997, at 11 p.m. PDT.

We apologize for giving an incorrect address for our own Eastbay Astronomical Society web site in the *Refractor* last month. After some unavoidable turmoil, we expect fewer problems from now on with either of the two addresses. Come and see what is on-line at http://silcon.com/~eas or http://chabot.cosc.org/eas. We would really like comment and feedback on this effort.

Dave Rodrigues suggests a number of his favorite web sites. Hubble Space Telescope greatest hits, 1990-1995 — http://oposite.stsci.edu/pubinfo/BestOfHST95.html Space Shuttle predictions are at http://shuttle.nasa.gov.

For an interesting diversion, send an electronic postcard to a friend at his or her e-mail address. Choose from several space and astronomy related designs, including a photo of Mars. Go to http://observe.ivv.nasa.gov/nasa/fun/postcard/sendcard.html. Remember this site as Christmas nears and you may have forgotten to send out your holiday cards on time.

José's Observations

by José Olivarez

The planet Saturn comes into opposition on October 9 at a distance of 780 million miles from Earth. On that date its equatorial diameter subtends 19.71 seconds of arc and its light takes 69.81 minutes to reach Earth. The rings are tipped 10° from edge-on and present their southern side to the Earth.

Voyager 1 image of Saturn from 5.3 million km four days after its closest approach in November, 1980. This perspective allows a view of Saturn looking back towards the Sun. The shadow of Saturn can be seen on the rings, and Saturn can be seen through the rings as well. Some of the spoke-like ring features are visible as bright patches. Saturn has a diameter of about 12,000 km.

Saturn's rings make Saturn unique and strikingly beautiful. Like Jupiter, it can also be an object of fascination as well because a telescope as small as four inches in diameter will reveal a faintly banded globe, two distinct rings and four satellites. The zones and belts of Saturn are harder to discern than those on Jupiter partly because of Saturn's smaller angular size but mainly because a high altitude haze layer on Saturn hides the banded cloud deck below. At most, moderate sized telescopes will show a lighter equatorial zone and dusky polar regions on the globe. Two rings can be discerned easily with 4-inch and larger telescopes because of the rings' principal division which is named after Domenico Cassini who first detected it in 1675. Cassini's Division is 3000 miles wide and divides "Ring A" from "Ring B." Ring B is the inner, brighter and broader of the two rings. This year, Cassini's Division will probably be most easily detected at the ring's "anse" or at the ring arcs that are farthest to the right and left of Saturn. In November and December, also look for the dark arc of shadow that the globe casts on the rings. In a normally inverted image of the planet (south at the top), the shadow arc will appear at the ring plane on the right side of the globe.

The Saturnian satellites that can be seen in 4-inch and larger telescopes are Titan, Rhea, Tethys and Dione. At 8.4 visual magnitude, Titan is the brightest and can be seen in a 3-inch telescope. Rhea is the second brightest satellite at 9.7 magnitude, and Dione and Tethys are almost brightness twins at 10.4 and 10.3 magnitudes respectively. The order of these satellites from Saturn, by increasing distance from the rings is Tethys, Dione, Rhea, and Titan. It is said that under excellent seeing conditions, the minute disk of Titan can be perceived in a 12-inch telescope.

The *Double Star Observer* is an international quarterly newsletter dedicated to the task of promoting interest in the science of visual double star observing. It still remains one of the world's few publications devoted exclusively to visual double star observing. If you believe that double star observing is important, then a subscription to the *Double Star Observer* will make a small contribution toward sustaining a field of astronomy that is badly in need of help. The subscription rate is now $4.00 per year, which covers the costs of publication and mailing. The *Double Star Observer* is published four times a year in January, April, July, and October. The Summer 1997 issue is currently available. For a subscription write to: Double Star Observer, c/o Ronald C. Tanguay, 306 Reynolds Drive, Saugus, MA 01906-1533. Telephone 617-231-1558 or e-mail etanguay@mit.edu.

Comet Comments *by Don Machholz*

A faint comet has been discovered "automatically" by the Spacewatch equipment at Kitt Peak. Comet C/1997 P2 (Spacewatch) will remain faint. Six more short-lived faint comets have been found on images obtained by the solar-orbiting SoHo satellite; its total is now 26. Meanwhile, Comet Hale-Bopp is now in the morning southern sky and Comet Meunier-Dupouy slowly brightens in our evening northern sky.

Comet Hunting Notes: With so many comets from the Kreutz Sungrazing Group being discovered by the SoHo satellite, amateurs have taken a renewed interest in sweeping along the path by which these comets are arriving. That path is now in the morning sky, having been behind the Sun this past summer. The comets are very faint in the weeks before perihelion and it may take CCD imaging to capture them. The brightest members, although rare, can still be discovered visually.

Date (00UT)	R.A. (2000)	Dec.	Elong.	Sky	Mag.
C/1995 O1 (Hale-Bopp) [Puppis-Vela-Carina]					
09-29	08h07.3m	-36°38'	68°	M	6.0
10-04	08h08.9m	-38°46'	70°	M	6.1
10-09	08h10.0m	-40°53'	72°	M	6.2
10-14	08h10.5m	-43°00'	75°	M	6.3
10-19	08h10.3m	-45°05'	77°	M	6.4
10-24	08h09.3m	-47°08'	79°	M	6.5
10-29	08h07.6m	-49°09'	81°	M	6.6
11-03	08h04.9m	-51°07'	83°	M	6.7
C/1997 J2 (Meunier-Dupouy) [Draco]					
09-29	14h52.6m	+61°04'	70°	E	11.2
10-04	15h05.1m	+60°15'	71°	E	11.1
10-09	15h23.8m	+59°24'	72°	E	11.1
10-14	15h39.5m	+58°30'	73°	E	11.0
10-19	15h55.2m	+57°33'	73°	E	11.0
10-24	16h10.9m	+56°33'	74°	E	10.9
10-29	16h26.5m	+55°30'	74°	E	10.9
11-03	16h42.0m	+54°25'	75°	E	10.8

Object	*Hale-Bopp*	*Meunier-Dupouy*
Peri. Date (1997):	1997 04 01.13800	1998 03 10.4346
Peri. Dist (AU):	0.9141405	3.050393
Arg/Peri (2000):	130.58915°	122.6927°
Asc. Node (2000):	282.47069°	148.8384°
Inclin. (2000):	089.42943°	091.2715°
Eccentricity:	0.9951172	1.001491
Orbital Period:	~2500 years	Long Period

DATELINE OCTOBER

5	1882	Robert Goddard, born
21	1897	Yerkes Observatory, University of Chicago, dedicated, largest refractor, 40 inches
14	1947	First supersonic flight, Chuck Yeager
4	1957	Soviet Sputnik 1, first artificial satellite
1	1997	New Moon, 09:51 PDT = 16:51 UT
6	1997	Scheduled Cassini launch, 05:38 EDT
9	1997	First Quarter Moon, 05:22 PDT = 12:22 UT
9	1997	Saturn at opposition, 22 PDT = 05 UT 10 October
15	1997	Full Moon, 03:57 PDT = 03:46 UT 16 October
21	1997	Orionid meteors maximum.
22	1997	Last Quarter Moon, 21:49 PDT = 04:49 UT 23 October
26	1997	Return to Standard Time. 2 a.m. PDT= 1 a.m. PST

✔ Check our our Web Sites at:

http://silcon.com/~eas

http://chabot.cosc.org/eas

You'll find:

✔ The latest copy of *The Refractor* with images in color.

✔ Information about the **Eastbay Astronomical Society**

✔ Great astrophotographs by **EAS** members.

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 *Refractor* editor, Ellis Myers. Phone (510) 284-4103. We would be happy to include your work.

FUTURE CONJUNCTIONS

9 October. EAS board meeting. 7:30 p.m.

11 October. Eugene Shoemaker Memorial. Flagstaff, Arizona.

11 October. EAS lecture meeting. Maria Mitchell: First Woman of American Astronomy. The Comet Players.

11-12 October. Festival at the Lake.

30 October. MoonDazzle II. Cal State Hayward.

8 November. EAS lecture meeting. Don Davis, Space Artist.

13 November. EAS board meeting. 7:30 p.m.

13 December. EAS lecture meeting. Dr. David Cudaback. High-Altitude Astronomy.

Rotary-Chabot Planetarium Shows

Fridays and Saturdays, 7:30 p.m.

For information and show schedule, call (510) 530-5225.

Our Place in the Universe through November 22

Eastbay Astronomical Society, Inc.
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