

The Refractor

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

Volume 79
 Number 3
 November 2002

This month's meeting will be:

Meade Night

“Astro toys, for astro girls and boys”

Saturday, November 9, 2002

Astronomy Hall, 2nd Floor, Dellums Bldg
 Chabot Space & Science Center, Oakland

- Announcements – 7:30 pm
- Speaker immediately after

This month, we will have a representative from Meade Instruments Corporation, Coronado, and others, showing off some of their product lines in computer controlled telescopes, eyepieces, and various other accessories. Be sure to bring your significant other, and make a big show over anything you might want to get for near-term holiday or birthday gift(s)! If the weather permits, we will have a Meade star party, with several of their instruments set up and working. If the weather doesn't permit, we will set the telescopes up in the Planetary Landscapes building and demo and discuss them, there. Find out how to set up and operate one of them thar fancy “goto” telescopes, with a computer database of 30,000 objects(!) That's more than you'll ever actually see from most locations and times, but it's always nice to have a *choice*.

The Meade Instruments Corporation began in 1972 with an initial capital of \$2,500 and a 2x4" ad in Sky and Telescope magazine as a supplier of small refracting telescopes. Run from a single-room apartment and a PO Box, the company grew over the decades to the publicly owned corporation with worldwide sales that they are today.

If you're really interested, Chabot is hosting a **Telescope Buyer's Workshops Day** from 1-6 pm the afternoon of our Saturday meeting. It will be geared toward the novice user, with a rotating series of 20-minute mini-classes on how to buy and use telescopes and their accessories. Meade, Coronado, and the other vendors will be on-site to show their wares.

Tickets to the event are \$15 Non-members/\$10 Chabot Members/\$5 Youth (12 and under) and include General Admission to the Science Center. Tickets may be purchased at Ticketweb.com or at the Chabot Box Office, (510) 336-7373. Of course, the EAS meeting is free. ★



In case you missed it, Conrad Jung caught this series of photos of the spectacular Minuteman launch last month. Quite a show!



This 2003 edition of the Meteorite Calendar is available now at Chabot's Starry Night gift shop.

Inside This Issue:

Women Pioneer Astronomers	2
Leonids Invitation	3
Swap Meets	3
EAS Exo-Planet Project	4
Editor's News n' Views	5
Great Planetary Season Begins	6
2003: A Spees Odyssey	6
EAS Membership Signup/Renewal form	7



Part I: Dorothea Klumpke Roberts Pioneer Woman Astronomer

By Don Stone, Eastbay
Astronomical Society

On March 6th,
1925, along with Earle
Garfield Linsley, Dr.
Dorothea Klumpke
Roberts became one of

a group of ten people at Chabot Observatory to officially become the very first Eastbay Astronomical Society members. In January 1928 she paid \$10 to become its first Life Member. At that time, the yearly membership fee was \$1.50. Ten dollars was an enormous sum for a tiny, struggling club to get in such times, and her donation probably helped the EAS survive! She was a true pioneer not only to the EAS but also to the worldwide astronomical community.

Dorothea was born on August 9, 1861 to a German immigrant father, John Gerard Klumpke (1825-1917) and Dorothea Mathilda Tolle, (? - 1922) in San Francisco. Her father had come to California as a boy, and in 1850 tried his luck at gold prospecting without success. However, he did succeed as a real estate broker, and eventually became quite wealthy. In 1855, he married Dorothea Tolle, and they had five daughters and two sons. The five daughters went on to have distinguished careers. One son became a businessman in San Francisco, but the other died as an infant.

In 1877 the Klumpkes decided that the rough and tumble life in frontier San Francisco was not conducive to a good education for their children, and decided to have them all educated in Europe. They were taken that year by their mother and placed in schools in Germany, Switzerland, and France. For many years after that, the mother traveled back and forth to visit her children. (Talk about commuting!)

Anna (the eldest sister) became a noted artist specializing in landscapes and portraits. She became the protégé and later partner of Rosa Bonheur. Rosa obtained a license that allowed her to dress in trousers with a smock and ride astride a horse like a man. When Rosa passed away in 1899, Anna inherited her fortune and chateau. The second-eldest daughter, Augusta, became a noted physician, specializing in neurology. She and her physician husband, Jules Déjerine, founded a clinic and authored numerous works on medicine. The two younger sisters found successful careers in music. Mathilda became a gifted pianist, and was a pupil of Marmontel, while Julia found her calling as a concert violinist and composer, who studied under Isaye.

Dorothea, the third eldest sister, was born on August 9th, 1861. After she and her sisters went to Europe for their “continental education,” she initially started out in music, but switched to astronomy, and enrolled at the University of Paris, where she earned a Bachelor of Science degree from the University of Paris (the Sorbonne) in 1886. She later won a post as attaché in the Paris Observatory. Her first work was with G. Bigourdan and Schulhof, after which she worked with the pioneer astrophotographers Paul and Prosper Henry. The two brothers used a new 34 cm refracting telescope designed specifically to photograph minor planets (asteroids). Dorothea’s job was to measure star positions and reduce the data on the astrophotographs. She also worked on stellar spectra and studied meteorites.

In 1886, Sir David Gill of England, proposed that the nations of the world join together and create an atlas of all the stars. The Director of the Paris Observatory, Admiral Ernest Mouchez, liked the idea so much that he suggested a meeting should be held in Paris to organize such a massive undertaking; thus was born the *Carte du Ciel* project. In April 1877, Dorothea found a job at the International Congress of Astronomers as a linguist, translating all the papers into French for the official records. The *Carte du Ciel* venture required the entire sky to be photographed down to 14th magnitude on plates of 2° a side. Plans were made for the Paris Observatory to do a major chunk of the sky as its official part in this enterprise. Also, a catalog was to be prepared listing all the stars to the 11th magnitude.

It soon became obvious to Mouchez that the flood of plates needing measurement and reduction was overwhelming the staff of the observatory. He therefore initiated a search for a director to head a special bureau to handle the work.

In 1889, Dorothea became the first recipient of an award, the Prix de Dames, from the Société des Astronomes de France. In 1893, she was made an Officier d’Académie of the Paris Academy of Sciences. Both honors were a first for a woman. So it was, that in 1891, despite being a foreigner, and a woman, Dorothea beat out 50 men for the post as Director of the Bureau of Measurements at the Paris Observatory. It was an immense project. After the first 96 charts had been made, it



Back then, much of the “mundane” jobs of measurement and reduction of stellar photographs were done by women.

(Continued on page 3)

Leonids observation invitation

Hello, I am responsible for gathering a team of visual meteor observers to watch the Leonids from Steward Observatory on 9157 ft. Mt. Lemmon near Tucson, Arizona. This observing team will be a part of Peter Jenniskens Leonid MAC 2002 program (Multi-Instrument Airborne Campaign) and we will be operating a real-time reporting system that allows each observer to "click" in their observations as they happen. This real-time data is then made available to the web, NASA, satellite operators, and other interested parties. More information can be found at the Leonid MAC web site: leonid.arc.nasa.gov <<http://leonid.arc.nasa.gov>>

We have use of the facilities on Mt. Lemmon thanks to the Aerospace Corporation and one of their astronomers, Ray Russell. We will have full use of the dome which contains a warm room, a bathroom, and an on-line computer station.

Accommodations are dormitory style with bedrooms, common bathrooms and showers, and a common kitchen/dining area. Observers must bring their own food, and there are dining and grocery opportunities at a small town near the summit.

This year's team will be led by Jim Richardson, who is currently working at the University of Arizona's Lunar and Planetary Lab in Tucson. With peak activity predicted to occur on the morning of the 19th, our tentative dates of operation are November 17-20.

We need to find experienced meteor observers who can provide us with accurate data, and I hope you can join us for this year's Leonid MAC mission. If you have any questions about the program, don't hesitate to contact me. ★

Dave Holman daveh@lmi.net

(Continued from page 2)

was estimated that a pile of all the Paris charts would stand about 37 meters high.

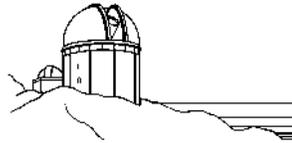
On December 14, 1893 Dorothea read her doctoral thesis, "L'Étude des Anneaux de Saturne" (Study of the Rings of Saturn) before a large crowd of expectant professors and several hundred others at the Sorbonne, winning unanimous assent for her degree as a Docteur-des-Sciences. Her academic discipline was mathematics and mathematical astronomy. She defended her thesis so well, that Dr. Darboux of the examining committee (which also included Drs. Tisserand and Andoyer) graciously said in her honor:

"Your thesis is the first in which a woman has presented and successfully defended before our faculty to obtain this degree. You worthily open the way, and the faculty unanimously makes haste to declare you worthy of obtaining the degree of Doctor."

By comparison, Harvard did not confer this title until the mid-20th century. That honor was first conferred on Cecilia Payne Gaposchkin.

Part II of this article will appear in the December issue of The Refractor ★

Future swap meets



**Sunday, November 10, 2002,
1:00 PM**

The San Jose Astronomical Association will host their annual swap meet at Hogue Park in San Jose.

Telescopes, Eyepieces, Mountings, Mirrors, Lenses, Clock Drives, Books, Camera Equipment, Star Charts, Finders, Tubes, Diagonals, Photographs, Space Art and more. You name it- it's likely to be there! Check your garage and closets for anything astronomical you would like to sell. Anyone can buy and sell! It's fun and easy! This is the second year for the swap, which is a follow-on to the Spring Auction that has been run for some years. There is no auction, just the Swap sale.

Joe Sunseri of Earth and Sky Adventures is expected to be there with many fine new and used items. <<http://www.astrosales.com/>>

Doors open at 12:30 am to set up tables and bring in material for sale. Selling will begin at 1 PM, and will run as long as needed (probably 3 PM). Each buyer pays the seller. Sellers are to keep track of their sales and pay 10% commission (fully tax deductible), with a cap of \$50 for any one item, \$500 maximum per seller. There are no table fees. Please bring items that would interest the astronomical audience such as astronomical stuff, Science Items, and Tech Items. The SJAA reserves the right to turn away inappropriate items for the swap.

Do you have a large item to sell such as a telescope? Please email swap@sjaa.net with a description and a photo of the item or a link to your own website for some pre-swap publicity. For more Information and directions, visit our web site at <<http://www.sjaa.net>> or <http://www.sjaa.net/swap.html>



Tuesday, November 19, 2002

The Mt Diablo Astronomical Society will have its annual swap and sale meeting, and everyone is welcome to bring items for sale and hopefully purchase items for sale by others. The fee is a simple honorary 5% of sales.

If you have something you'd like to sell, let Ralph Requa know at: rrequa@chw.edu

There is also a bake sale of goods provided by members and friends.

Doors open at 5:45 and the meeting begins at 7:15PM.

If you are interested in attending, contact me for directions to the meeting site in Concord CA.

Jim Scala e-mail: jscala2@attbi.com ★

Exo-Planets

by Dr. Terry Galloway

This is a hot new area in astronomy today that has the fascinating possibility of finding earth-like planets around other stars. Dr. Terry Galloway, long time member of the EAS and a Chabot Board Director, has started up an advanced astronomy group in Exo-Planets. The work is being done on Rachel - the large 20-inch Warner-Swazey refractor at Chabot Space & Science Center under the guidance of both Geoff Marcy and Debra Fischer from the University of California, Berkeley. More Exo-planets have been discovered by Geoff Marcy's group than any other in the world. They are using telescopes at Lick Observatory on Mt. Hamilton, and the giant Keck reflectors on Mauna Kea in Hawaii.

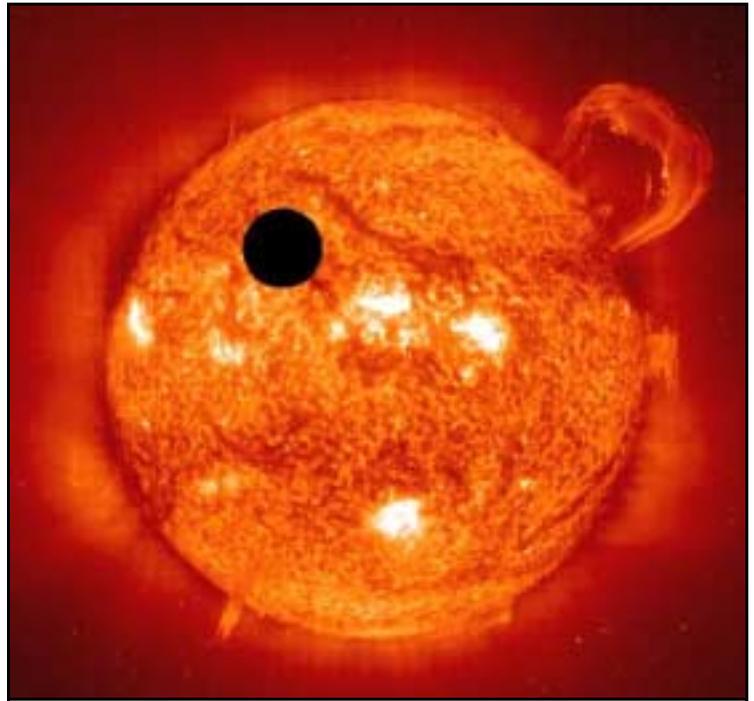
The four initial members of this new Exo-Planet group are Dr. Steve Mathews, Dr. Terry Galloway, Bruce Skelley, and Paul Hoy. The instrumentation used for these studies involves the very highly sensitive gallium-arsenide photo-cathode photomultiplier tube made by RCA (#31034). To reduce the Johnson thermal noise, the tube is chilled down to -34°C by means of a thermo-electric chiller. The photons from the star in question hit this photocathode and knock off about 3 electrons that are accelerated through a high voltage gradient using 11 stages of multiplication. In this manner a significant current output is possible, ranging from 10 to 10,000 picoamperes. The group is using a highly sensitive Keithley picoammeter as the electrometer to detect these low currents and send the amplified signal to a computer system to record and analyze the data.

All of the measurements made by Geoff Marcy's group have involved star wobble from one or more planets orbiting closely around the star by looking at the Doppler shifting the spectral lines back and forth as the planet moves around the star. In Rachel's dome there is a graphical display of some of Geoff Marcy's group results -- and they are impressive indeed. Come into Rachel's dome and see the display and the equipment our new group is using.

It is the task of Chabot's new Exo-Planet group to exam-



Image of reference star on the right, and the fainter target star on the left, HD209458



If a large enough planet's orbit happens to pass in front of, and thereby partially occlude, a distant star (from Earth's point of view angle), we might be able to sense it by measuring a regular drop in light level from that star.

ine the light dimming of these stars around which the planets are orbiting by means of this photomultiplier, and augment the spectral line shifting method used in the past by Geoff Marcy's group. This will provide additional orbital information as the planet occults (goes in front of) the star and causes a dimming of its light. The stars that will be studied by our group range from 6 to 8th magnitude and the light dimming is around 1.5 to 3%, so attention to stray light and systematic fluctuations are key to our success. Measurements have been started over the last several weeks, after the photoelectric equipment was assembled and calibrated.

The group is looking for more members, particularly high school and undergraduate college students interested in this exciting new area in astronomy and want to get real live, hands-on experience with a large refractor telescope of professional scale. The new group members will learn about photoelectric measurements of low light level as well as scientific measurement, data taking, data reduction, data analysis and interpretation. And of course, experience in using telescopes late at night when it is cold and dark will be part of this experience.

Come and talk to Terry Galloway on any Sunday during the day, when he is volunteering in Rachel's dome and describing the telescope history, operation and objects observed by the public. We guarantee it will be an exhilarating experience and science adventure not to be missed. We will be summarizing other of the eleven new groups being formed over the coming year in this EAS Bulletin; so watch here for the articles. ★

Editor's News and Views

by Don Saito

All you die-hard amateurs out there can breathe a sigh of relief, now: Daylight Savings time is officially over (as of Sunday, October 27th). The season of short nights and late starts is done with! Just as soon as you get home from work, you can pretty much go out and begin viewing; how nice! Of course, you're also now going to freeze your buns off for the next 6 months, but that's just another one of Life's double-edged swords. Our October 6th Member's Only Night went pretty well, though not many EAS members were there to view. But, to make up for our people's absence, there were a fair number of CSSC Volunteers who happened to be there that night as well, and we invited them to "do the view." **Ralph Requa**, who by the way is our newest official Telescope Operator (recently checked out and approved to run Leah by **Conrad Jung**), bounced around to different objects using Leah, while I put Rachel on M57 and M15. I unfortunately am still having trouble finding objects with Rachel, and will need to practice a bit more before I can bounce around with the aplomb of a Conrad. Ralph really saved the day (night) that night, being able to find a lot more objects - thanks Ralph!

The next Members' Only View Night is Sunday, Nov 3, starting at 6:30pm (weather permitting, of course). If the weather is in question, call Don Saito at (510) 482-2913 to see if we're going to do it or not.

Rick Sarrica informs us that the magazine, *Via*, has a very nice article about the free telescope viewing up at Chabot Space and Science Center. The article gives a bit of the history of the telescopes, and they quote **Conrad Jung**. Check it out at http://www.viamagazine.com/weekenders/get_spaced_out02.asp

This month's Distinguished Lecturer Series at Chabot is being given by EAS member and Fellow of the Royal Astronomical Society, **Robert Garfinkle**, in honor of Native American Heritage Month, speaking on "The Mimbres Plate: The Moon and the Supernova of 1054." That will be on Nov 21 starting at 7:30pm. There's a small \$5 fee to attend, and a dessert reception follows. For more information call 510 336-7373.

This is it - the "last" (for we who are alive today, at least) Leonid Meteor Storm is upon us. There won't be another until the year 2098! Last I heard, **Carter Roberts** and **Dave Rodrigues** were invited by **David Levy** to join him and **Carolyn Shoemaker** at David's place in Arizona to spend some quality meteor time, there, and I plan on heading out to Sunspot, New Mexico. Sunspot is where we keep the National Solar Observatory, which should be one of the prime places on the entire planet to see it. If you go anywhere and see anything, we'd like to hear from you, too.

Tips to view the 2002 Leonids:

1) The event occurs in the early morning hours of Tuesday, November 19th - NOT the evening of Tuesday the 19th! Don't get them mixed up, or you'll miss the whole thing. So, as a likely scenario: be up before midnight the night of Monday the 18th, let midnight come and go (it's now the early morning of Tuesday the 19th), and NOW begin watching for meteors.

2) To make staying up during the wee hours easier, try to go to sleep early on the evening of Monday the 18th; somewhere around 4 or 5 pm would be great, but even a few hours before midnight would be helpful. It's also a good idea to bring someone else with you, so you can keep each other awake.

3) The peak is predicted to occur somewhere between 2:00 and 2:30 am, but if possible, stay up until dawn, as anything is possible.

4) If the weather looks bad, follow your plan, regardless. Even if it's raining, the skies *could* clear up for a period of time. Also, be prepared to move to another location if where you're at is no good. Sometimes, it's possible to simply drive to a clear section of sky.

5) Bring the following minimal equipment: reclining lawnchair or inflatable raft to lie on comfortably (it's much easier on the neck to be horizontal instead of vertical when looking up for hours at a time), sleeping bag (it's going to be cold), a moisture barrier such as a space blanket or tarp to keep the dew off, and a hat (something like 80% of heat lost from your body goes out through your head!) Other items, such as a thermos of hot beverage, or binoculars, or a music playing device, will make the experience nicer, but you don't need any of them to get the good views.

6) The moon will be full and sliding off towards the western horizon during the time of the event. Its glare will drown out the fainter meteors, but it should still be a pretty good show. If you could get into the shadow of a nearby mountain, that would help, but if you just get into the shadow of a nearby house, tree, or chair, that would help.

7) If you face the constellation Leo, you will see where the meteors appear to be coming from, but you can look at any part of the sky and still see plenty of meteors; even fac-

ing the opposite direction from Leo. ★

SPARE SHOTS

◀Double stars (twins) Carl Patrick (7 lbs) and John Robert (7 lbs 2 oz) Gorski were born August 12, 2002.

Congratulations to Alan and Dasha!

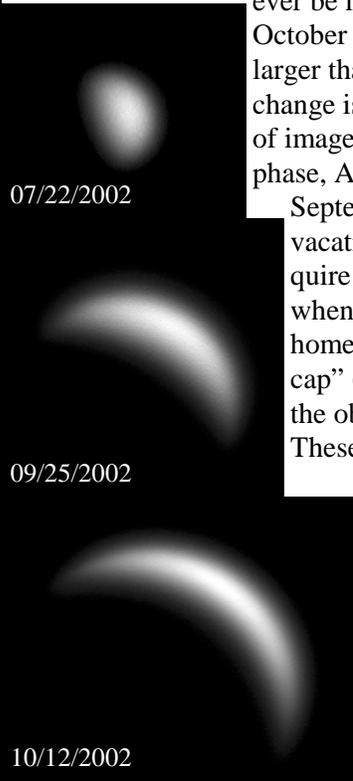


A Great Planetary Season Begins

By Jim Scala

Venus is now so close to the sun and at such low declination (-25° on October 25th) that it is best observed on the meridian during the daylight. Saturn rises at about 10:00 PM; since it's at 22° declination it is very high on the meridian at sunrise, Jupiter rises at about midnight and is similarly well placed at sunrise. Each one is a beautiful telescope and early risers are rewarded with spectacular views.

Venus reaches inferior conjunction on October 31st. In this context "inferior" means it passes between us and the sun as it overtakes earth in its orbit and passes into the morning sky. At conjunction Venus' slender crescent will exceed an arc minute in diameter, larger telescopically than Jupiter will ever be in this entire century. In fact, by October 7th Venus was telescopically larger than Mars can ever become. This change is nicely illustrated by the series of images taken on July 25 at gibbous phase, August 22 at Eastern elongation;



September 25th when I returned from vacation, and October 12th. I acquire Venus images in full daylight when it's on the meridian. I use a homemade, fully baffled "sun cap" (my name) to keep the sun off the objective and increase contrast. These Venus images show the planet as in an erect image telescope, a perspective that illustrates that it will pass below the Sun on the 31st.

Saturn offers something for everyone as it marches to opposition on December 31st. With its rings full open a loud

"Wow" is heard from anyone who looks at Saturn through a telescope; in my three inch refractor against the morning blue sky at 75X Saturn is breathtakingly beautiful. In my 228-mm refractor and steady air, the view exceeds awesome. Most people think "Jupiter" when you mention moons, but the average telescope shows more of Saturn's moons and they are just as interesting as they orbit the planet. Saturn's rings with their prominent Cassini division, more elusive Enke division and the crepe ring are always a challenge in addition to the belts on the planetary disk itself. In addition, there are subtle shadings and differences in color seen on both the rings and the planet which will be the subject of a coming S&T article.



Saturn 10/08/2002 12h 40m 26s UT
Moons L to R: Titan, Dione, Rhea, Tethys, and Enceladus



I have included two images of Saturn; one that shows the planet with its rings (1 by 2 arc minutes) and five moons and another (2 by 2 arc

minutes) showing the planet with the prominent Cassini division, the shadow of the planet on the rings and planetary belts. As it comes closer to opposition, the planetary shadow on the ring will slowly diminish until it disappears at opposition. This image brings out subtle color shadings that are the subject of investigation. All images are inverted as seen in a refracting telescope.

Continued on Page 7



2003: A Spees Odyssey

Join us for an out-of-this-world event honoring Oakland City Councilmember and Chabot Board Member Dick Spees. On the evening of November 16, Chabot will be the site of "2003: A Spees Odyssey," a retirement party for

Councilmember Spees, celebrating his 24-year career in public service.

Councilmember Spees played an instrumental role in the

development of the new Chabot Space & Science Center – providing leadership and helping to secure the funding necessary to build and open the new facility. Proceeds from the retirement party will be used to establish the Chabot Space & Science Center Education Fund, an endowment with the East Bay Community Foundation, and will help provide long-term support for the Science Center's outstanding educational programs.

The event will feature tastings of food and beverages provided by the East Bay's finest restaurants, wineries, breweries, and special entertainment throughout the Science Center.

Reservations are \$75 per person and sponsorships are available at \$1,000 and up. Please call (510) 625-0576 or (510) 238-7041 for more details. ★



Continued from Page 6

Jupiter is always King for amateurs who enjoy the planets. Its disc ranges from about 40 arc seconds to almost 50 arc seconds in size and a 25-mm telescope easily reveals its disk. In a good 50-mm telescope Jupiter is never the same two evening in a row. Its four bright Galilean moons run an ongoing race around the planet that is easily followed in good binoculars. Jupiter's belts are always changing and its red spot has been a permanent feature for a few centuries even if some experts claim it's getting smaller. My 78-mm refractor easily shows the red spot and the 228-mm in steady air reveals details that are fascinating. In the 228-mm transits of the Galilean moons are easily observed as small disks against the planet. Occasionally Jupiter's Moons occult one another.

I have included two images of Jupiter; one that shows the planet with three moons clearly visible (3.4 by 1.5 arc minutes) and another one (2 by 2 arc minutes) to illustrate detail on the planet itself. Both images together illustrate the wealth of observing detail awaiting the amateur equipped with a good 78-mm refractor.



Some considerations of planetary observing.

Bay Area seeing seldom permits 0.6 arc second detail on extended objects. So, although aperture is always important, at about 200-mm (8 inches) it only makes the image brighter, possibly larger and improves contrast. However, Bay Area seeing often places the larger telescope at a disadvantage. Consequently, at star parties visitors often say that my 128-mm (five inch) refractor shows more planetary detail that is more easily seen than in much larger telescopes; especially the abundant Schmidt Cassegraineans. One reason the refractor stands out against these telescopes is that in turbulent air the first airy disk merges in and out with the central disk; destroying subtle detail and ruining contrast on a planetary image. Hence, 100-mm to 155-mm refractors are often the champions of planetary observing against larger obstructed telescopes. ☆

MEMBERSHIP APPLICATION FORM

(Please print clearly)

Name: _____

Address: _____

City: _____

State/Zip: _____

Email: _____

Day Phone: _____

Eve Phone: _____

Do not print address in Membership Directory listing

MEMBERSHIP CATEGORIES:

- Regular\$24
- Family.....\$36
- Contributing\$40
- Sustaining \$60 or more
- Student (digital newsletter only)...\$10

Optional discounted magazine subscription:

- Sky & Telescope.....\$29.95
- Astronomy.....\$29.00

Optional tax deductible donations:

- Burns Library\$_____
- General Fund\$_____

Total Enclosed:\$_____

To help save the club money, I prefer to receive the newsletter in digital format.

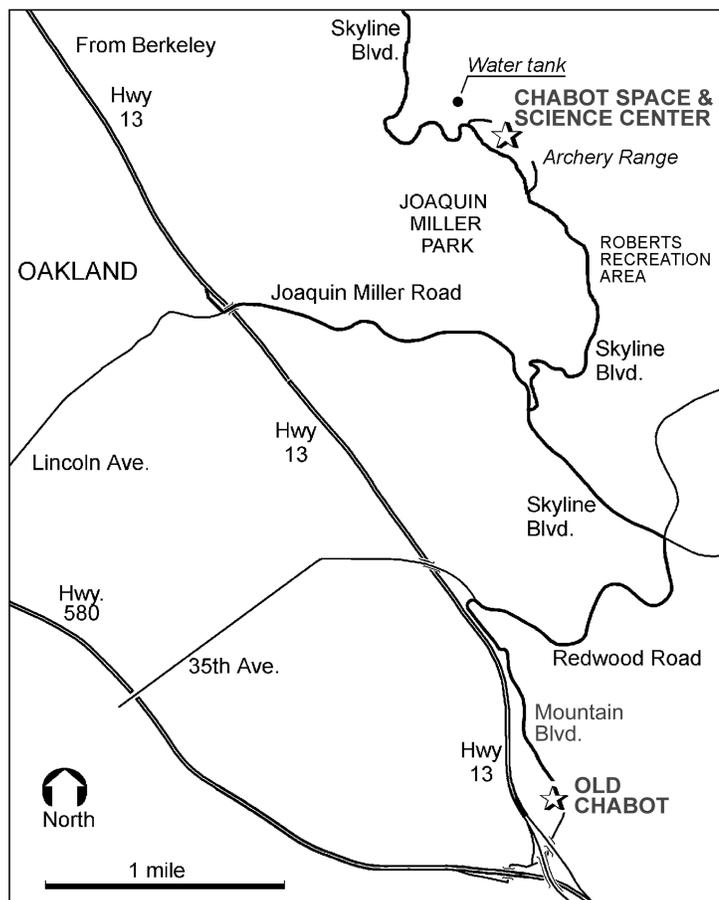
Please mail this form and your check or money order payable to:

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

For more information, contact Treasurer Don Stone at: (707) 938-1667, or ddcstone@earthlink.net, or the address above.

Eastbay Astronomical Society

At Chabot Space & Science Center
10000 Skyline Boulevard, Oakland, CA 94619
November 2002



FUTURE CONJUNCTIONS

- | | | |
|-----|----|---|
| Nov | 03 | 6:30pm EAS Members' Only View Night at Chabot |
| | 09 | 7:30pm EAS Meeting (Meade Day/Night!) |
| | 14 | 7:30pm EAS Board Meeting at Chabot |
| | 16 | 2-5pm Library work party at Chabot |
| | 16 | 2003: A Spees Odyssey |
| Dec | 12 | 7:30pm EAS Board Meeting at Chabot |
| | 14 | 2-5pm Library meeting and work party |
| | 28 | Axel Mellinger Meeting |

Eastbay Astronomical Society

President:	Carter Roberts	(510) 524-2146 cwroberts@earthlink.net
Vice President:	Phil Crabbe II	(510) 655-4772
Treasurer, Membership:	Don Stone	(707) 938-1667 ddcstone@earthlink.net

Articles and photos for *The Refractor* are encouraged. Deadline for the December issue is December 7, 2002. Items may be submitted by mail to the editor, Don Saito, 3514 Randolph Avenue, Oakland, CA 94602-1228. Internet email address: donsaito@pacbell.net. Day: (510) 587-6052 Eve: (510) 482-

Join the Eastbay Astronomical Society

- | | |
|--|--|
| <input type="checkbox"/> Regular, \$24/year | <input type="checkbox"/> Family, \$36/year |
| <input type="checkbox"/> Contributing, \$40/year | <input type="checkbox"/> Student, \$15/year (digital news- |
| <input type="checkbox"/> Sustaining, \$60/year or more | letter, only |
- Contact: Don Stone, EAS Membership Registrar
Telephone: (707) 938-1667 Email: ddcstone@earthlink.net
Mail: 19047 Robinson Road, Sonoma, CA 95476-5517