

SJAA EPHEMERIS

VOLUME 4 NUMBER 11 OFFICIAL PUBLICATION OF THE SAN JOSE ASTRONOMICAL ASSOCIATION November 1993



The Eyepiece
by Bob Madden

This month Patrick Donnelly has returned with his article on Double, Triple and Multiple Stars. Also we have an article on the Vixen 2.4 eye piece by Steve Walde. Steve presents some very interesting information on the Vixen and other eye pieces. During conversation with Jack Zeiders, Jack mentioned that he has heard reports that this is an excellent eyepiece.

Notice: Director elections are rapidly approaching in February and it is required in the By Laws that the membership is notified of the potential candidates in January. There are three seats available. I'm told the requirements are: A candidate must be member for at least one year or a member must have attended three successive Board of Directors meetings. Another important requirement is the nominee has accepted his name being placed on the ballot. Elections will be held during the February General Meeting at the Milpitas Library.

I would like to take this time and mention to you about a small telescope Paul Barton has built for the telescope loan program. Jack Zeiders received a 4-1/2" primary and a secondary mirror as a donation from members. I wish I could remember their names so they could receive credit. Anyway I used this small portable dobsonian at a Cub Scout

Nov 6: General Meeting at the Milpitas Library 8:00pm. preceded by the Board meeting at 6:15. The speaker, from NASA Ames Research Center will be Dr. Aaron Barnes, Research Scientist at the Theoretical Studies Branch.

Nov 13: Star Party at Fremont Peak or Grant Ranch (your choice). Sset 4:58pm, No moon.

Nov 19: Sar Party at Hoge Park. Sset 4:55pm, 41% moon, Mset 10:57pm.

Nov 20: No activity - too much moon.

Nov 27: Thanksgiving weekend.

No Observational astronomy class

Dec 4: No activity (2d before 3rd Q)

Dec 11: Star Party at Henry Coe SP or Grant Ranch (your choice). Sset 4:49pm, no moon.

Dec 17: Sar Party at Hoge Park. Sset 4:52pm, 25% moon, Mset 9:42pm.

Dec 18: General Meeting at the Milpitas Library 8:00pm. preceded by the Board meeting at 6:15. The speaker will be announced.

outing at Hoge Park on Friday, October 8th. We had difficult seeing because of clouds, but between them, I picked up Saturn at 20X.

Paul used a clever focusing arrangement - the mirror cell moves inside the optical tube and is still easily collimated. This allows the eye piece to remain fixed and with slight adaptation a second eye piece can be made to be parfocal. Paul took several photographs and notes, so we'll write an article on it. Nice job, Paul.

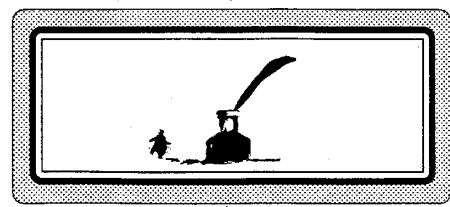
We had an other foul-up at the meeting location in October. We had received notice last February that a three day book sale would take place on October 2nd and we are absent minded

enough to forget about it. As it turned out Jack Zeiders, our Prez, met many members at the library and personally apologized to them for the mess-up (that's the same as foul-up). Honestly we're trying to get it straight. For the present the General and Board meetings will be held at the Milpitas Library, Observational Astronomy Classes at Hoge Park.

I'm about to test the readership of this newsletter. It seems each month the Board discusses where the general meetings should be held. Several live closer to Hoge Park and because we think there will be less trouble with scheduling, we would like to hold the meetings there. It is time to poll the readership - what would be your choice, Milpitas Library or Hoge Park. If there is another suitable choice the Board would like to know about it and its availability. Now! Please take time to send a post card or short letter on your choice. Address it to:

Bob Madden
1616 Inglis Ln
San Jose, Ca 95118

Please remember the classes finished in October for 1993 and will begin again in Jan 1994. Thanks to Jack Petersen for another 'stellar' performance leading the classes. Jack does a wonderful and interesting presentation each month. This is available to all and one should consider bringing a young person who is interested in science and astronomy. What an opportunity to start a young person on their journey through the universe!



HOW HIGH IS TOO HIGH? A REVIEW of the Vixen 2.5 mm Eyepiece

by Stephen R. Waldee

Waldee-Wood Astronomical Software

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William Herschel's contemporaries scoffed when they heard the great amateur brag that he sometimes observed at 6000x magnification; yet scientists of the following centuries confirmed that Herschel's homemade 1/45th inch diameter lenses did indeed perform as claimed! Burnham and Barnard reported that they used powers of 700, 1200, or even 1500 diameters with the great 36 - inch refractor at Lick Observatory. And Percival Lowell sketched interpretations of Martian "canals" with powers of 500x, 800x, and even higher.

Why is it that today's amateur astronomers are warned that they must be content with employing their telescopes at no more than "50 power per inch of aperture" or their views will crumble like the dusty, collapsed walls of so many lunar craters?

Clearly, no one could often employ the 36 - inch Clark telescope on Mount Hamilton at 50x per inch of aperture: the earth's turbulent air scarcely ever permits sharp views at 1800 power. During my dozen or so opportunities to look through the 36 - inch, objects were often fuzzy and distorted at only 460x; on just one memorable September night, Saturn was as clear and sharp as a satellite image.

Yet, for one of my most unforgettable views of Jupiter, brightly resplendent with belts, loops, festoons, and cloud bands, the instrument was a 3.5" Questar operating beyond 100x per inch of aperture, situated only 200 feet above sea level!

This observer has concluded that the old "law" of 50x per inch of aperture rests on even shakier ground than the other great 19th century subjective rule of observing, the Dawes limit.

It is helpful to beginners to be warned that \$99 drugstore refractors with 60 - mm plastic objectives and wiggly tripods cannot possibly provide satisfactory views at their advertised 400 to 600 powers; most look bad at 30x!

Yet, my tests of the new imported Vixen 2.5 mm eyepiece with a state-of-the-art small fluorite refractor indicate that with exquisite optics and calm, fall skies, the observer may sometimes more than double the optical "speed limit" of magnification. The boosted diffraction patterns visible with so-called "empty magnification" seem to be much less destructive of image clarity and definition than with simpler eyepieces.

The Vixen ocular is manufactured in Japan by the company that makes some of the fine binoculars and telescopes sold under the Celestron Brand name. Starting about 3 years ago, Vixen products were directly imported and distributed by Celestron.

The complete series of eyepieces ranges in focal length from 2.5 mm to 30 mm in barrel sizes of 1.25" (and 2.0" for the lowest powers). Though the apparent fields are on the narrow side, often no more than the average 45 degree orthoscopic, the eye relief (viewing distance from the output or eye lens) is quite long, having been standardized at 20 mm for each focal length. Therefore, the oculars employ relatively huge eye lenses of at least 20 mm diameter, whose dim green reflections reveal deep optical multicoating.

Vixen's designs require as many as 8 lenses, including a precision glass made of lanthanum, a trivalent metallic element that occurs in rare-earth minerals. Though pure lanthanum tarnishes readily in moist air, it is apparently stable in the colorless compounds employed in the coated internal elements of these oculars.

Collapsible eye cups are provided for spectacle-wearers, with rubber dew-resistant grips and grooved barrels for safer handling and focuser attachment.

I had previously owned a 4 mm Meade Research Grade orthoscopic for occasional planetary viewing, but the eye relief was so poor that I had to press up against the ocular until my eyelids brushed the lens and my head collided with the telescope. The task of using this ocular was so arduous that it seemed ludicrous to consider purchasing an eyepiece with almost half its focal length!

However, my first trials of the 4 mm and 2.5 mm Vixens convinced me that the problem of high-power oculars was mostly their terrible eye relief and not their intrinsically narrow telescopic fields.

One's eye approaches the Vixen with the same casual ease as when looking into a 26-mm Ploessl or 32-mm Erfle! As long as the telescope is well mounted and firmly centered on the desired field, it is possible to jump; from, say, a 15 or 20 mm ocular down to the 2.5 mm Vixen and quickly focus and re-center the object. There is no straining and craning to find the "sweet spot" for observing.

I have extensively tested the Vixen with my own very clean Meade 80-mm f/11 achromat and my partner Ron Wood's superior Celestron f/8 70-mm fluorite scope. In addition, cursory views through my longer focal length 4" f/10 and 8" f/5 reflectors promise occasional use when steady air allows clear views above 50x per inch of aperture.

My only disappointment with the Vixen is that the eye lens surface must be kept scrupulously clean, as any dust specs or hairs will be seen in focus against a bright background such as the surface of the Moon. Take care in using this eyepiece at public star parties, lest an inexperienced viewer accidentally stick his or her nose into the lens surface! If the outer lens does become dirty, try cleaning it carefully with a few drops of 50-50 mixture of 99% isopropyl alcohol and water, or diluted acetone, on a soft cloth. Be very thorough: smeared greasy spots at the edge of the field will be quite noticeable against the bright Moon.

The following table shows our observations of performance of the Vixen 2.5 mm ocular compared to other eyepieces. It should be pointed out sometimes we had to employ a Barlow to equal the magnification of the Vixen: in some of these cases, the performance of the oculars themselves may have been degraded by the external Barlow used, or by any slight optical mismatch that may have occurred. This indicates the virtue of employing the perfectly-matched negative Barlow lens incorporated right inside the Vixen eyepiece itself.

Ocular Brand	Focal Length	Barlow	Scope	Mag.	Power/ Inch	Comments
<u>Vega - Magnitude 0.04 Star</u>						
Vixen	2.5	none	Celest.	224X	81X	Flawless, textbook diffraction pattern.
"	2.5	Brandon 2X	Celest.	448X	162X	At least 5 diffraction rings visible!
TeleVue	4.8	Brandon 2X	Celest.	233X	85X	Very similar to Vixen without Barlow
Orion	5.0	Brandon 2X	Celest.	224X	81X	Core slightly misshapen, rings broken and asymmetrical
<u>Epsilon Lyrae - Famous "Double Double" Stars</u>						
Vixen	2.5	none	Meade	360X	116X	Perfect wide split; clean round images
"		none	Celest.	224X	81X	Similar but with slightly larger stellar cores
TeleVue	4.8	Orion 2X	Celest.	233X	85X	Perhaps slightly softer than Vixen
<u>Saturn</u>						
TeleVue	4.8	none	Celest.	117X	43X	"Tack Sharp" - Almost as clean as my 8" at 220X! Fairly steady, slim Cassini division.
Vixen	2.5	none	Meade	360X	116X	Soft, no Cassini div.
"		none	Celest.	224X	81X	Sharp with fading but visible Cassini div.
TeleVue	4.8	Brandon 2X	Celest.	233X	85X	Slightly softer, glimpses of Cassini div.
"		Orion 2X	Celest.			Cassini division only occasionally visible
<u>Near-Full Moon: Terminator region around Mare Australe</u>						
Vixen	2.5	none	Meade	360X	116X	Slightly soft but surprisingly clear & high-contrast
"	2.5	none	Celest.	224X	81X	Sharp, clear, and aesthetically pleasing
<u>Near-Full Moon: Famous Crater "Linne"</u>						
Vixen	2.5	none	Celest.	224X	81X	Very bright and discrete
"		Brandon 2X	Celest.	448X	162X	Tiny bright rays at 90 degree angle emanating from center of crater!
"	2.5	none	Meade	360X	116X	Softer and more vague than in fluorite scope: "empty magnification"
Telescopes: Meade 80-mm refractor, Model 312 on home-made German equatorial mount; Celestron 70-mm Fluorite on Super Polaris mount. Observers: Ron Wood, Ryan Wood, Steve Waldee. Objects near zenith.						

DOUBLE, TRIPLE, AND MULTIPLE STARS

by Patrick Donnelly

I finally was able to do some observing over the past week, and in spite of the Harvest Moon, I did observe some double stars and some open clusters. There are so many clouds in the United Kingdom, I have found it almost impossible to have a completely clear night. I have become fairly good at observing binocular double stars, but this type of observing is only a stop gap. I have also been observing MIRA in the constellation of Cetus. It gives me something to do, whilst (English spelling) I am working away from home. While observing last night, I did take some time to observe some double stars in Cetus.

Cetus, the Whale, is a constellation located just below the celestial equator. It contains some very interesting objects. The most interesting is Omicron Ceti (Mira), the long period variable. Mira is a red giant variable star with a period of approximately 330 days. It is located about 220 light years from the earth. In addition, it is part of a truly interesting double star system. Both the primary and secondary components are variable stars. The secondary is best seen at minimum of the primary, because of the very close separation of only 0.7 - 1.0". I have seen the secondary under excellent seeing conditions. The system is a true binary system with a period of 260 years. The secondary also is a variable star with an apparent magnitude change from 10 - 12 with an uncertain period. Being able to monitor this system over an extended period of time would be an excellent science project for someone. There is also a third companion at 118" and at magnitude 9, but it is not part of the system. This component is the star you usually see next to Mira under very low power in the telescope.

Another good double to observe is Gamma Ceti (another member of the Gamma Gang). Gamma is a true binary system about 70 light years from the earth. The system consists of a 3.6 magnitude primary and a 6.2 magnitude secondary. The period of revolution is about 3000 years. Their color is a fairly

vivid yellow (primary) and a blue (secondary), making them another good candidate for a twin of Alberio. The only difference is the separation. They are separated by a fairly close 3". This is a fine double and fun to observe. Whilst in the area check out Alpha Ceti. Alpha and 93 Ceti form a nice very wide double (optical though). There is also a very dim 11th magnitude pair in the same field of view.

If the moon is not visible, you should next try for M-77, a spiral galaxy. In the vicinity of M-77 there are two double systems to observe. 84 Ceti and Σ274. 84 Ceti (Σ299) is a true double system about 100 light years away. It consists of magnitude 6 and 9 companions separated by about 4". Use high power on this one. 84 Ceti is in the same low power field with M-77. Σ274 is a rather easy pair consisting of almost equal magnitude 7 stars and separated by 13.5". It is also a true binary system over 500 light years away.

As a final note, there are three (3) other objects to observe in this region of the sky. Galaxy NGC 253 is nearby and is one of the brightest galaxies in the sky. Tau Ceti is a very bright (3.6 magnitude) and very close to the earth: only 11 light years away. Lastly, Alpha Piscium is a close, but interesting double system to observe and always a challenge to observe.

Some notes from the Space Telescope Science Institute in Baltimore

(supplied by Jim Van Nuland)

Comet Shoemaker-Levy (1993e) may really be more of an asteroid; spectral analysis reveals little extra hydroxyl, meaning much less water than a comet is supposed to have. The object encountered Jupiter's gravity last November. This threw it into an eccentric Jovian orbit (NOT a Solar orbit). The object is in many pieces (confirmed by Hubble Space Telescope photos); may have been ripped apart by Jupiter gravity. Effects of the Jupiter collision are totally speculative at this point; it's unknown exactly how close together the impacts of the object's pieces will be. Also, of course, Jupiter may or may not have a

"solid" core. Collision will be on the far side of Jupiter; the impact point will rotate into view about 90 minutes after impact. Observations are being planned with HST and other instruments to monitor brightness of Jovian moons to view any reflected light from the impact. There is a telnet address for a kind of bulletin board being used by scientists planning the observations. That address MAY BE:

telnet pbssbn.astro.umd.edu
>c1993e no password

The speaker was NOT sure about the above address.

50 Webelos

by Bob Madden

During the week of 10/3 Bob Elsberry called on some members to help him give a star party for one of his Cub Scout pack. Yes, you do not turn this opportunity over to 'Someone Else' - Remember he isn't around any more. Bob got:

'Crazy' Ed Erbeck
Bill O' Shaughessy
Bob Brauer
Bob Madden (me)
Bob Elsberry (himself)
Jim Van Nuland

You guessed it! It was the beginning of the cloudy nights, but we went anyway. And we were rewarded with about 50 inquisitive young boys and girls. We were lucky enough to be able to see through some holes in the clouds and show the group Saturn and several other stars. I used the new 4-1/2" Dobsonian Paul had just finished painting that afternoon. This telescope is a table-top version and required a set of steps to get to the eye piece. I had forgot such necessities and it created a problem. The problem was solved by aiming the telescope at the mountains and porch lights. I told several of the boys they were looking at a blue and a gold star. It worked for a while until they figured it out. It was a good trick and every one had fun. Come, give a star party a try. Call Jim Van Nuland for November's parties.

Houge Park Sept 24
By Jim Van Nuland

Some of the regulars were up at Lick Observatory, but there were plenty of scopes on the field. It was nice to see the Association's C-11 back in action, in the competent hands of Ken Ward. The sky was decent, with just a little softness to the seeing, following a hot day, but Saturn was lovely, as usual.

We had a number of Paul Graves' students there, but Paul was absent; since his kids get extra credit for coming, we felt that Paul should lose points for missing this one. His students were in full agreement!

We showed the Moon, Saturn, M13, M57, and probably others (I didn't get to walk around much). In addition to the standard objects, I was able to locate Uranus, which, fortunately, had a star very close by to prove that the scope was in focus, and that we were indeed seeing Uranus' disk. Its color was mostly washed out by the nearby Moon.

Just 68 minutes north was Neptune. After setting the C-11 on Uranus, we slewed up to the expected declination, and there it was! Very tiny at 2 arc-seconds diameter, but bluish and definitely non-stellar! After seeing it in the C-11 I was able to find it in the 8 inch as well.

We may have shown these two planets at another public star party, but I don't recall when. In general, they are too small to readily identify without extended study, while the customers get bored.

There were a few people that hung around later than usual, and it was nearly midnight by the time I left the park. A good night!

Introductory Astronomy Class
Houge Park. 8 pm, Sep. 25
Conducted by Jack Petersen

Present:

Ben Lee Jim Van Nuland
Bob Madden Bill O'Shaughnessy
David Simons Dan & Alice Finley
Bob Keller Jack Petersen (!)

Jack had been on the Lick Observatory pilgrimage on Sept. 24, which had been organized by Rick

Locations of SJAA Star Party sites a follow-up
Jim Van Nuland

When Alice and Dan Finley sought positions for our star party sites, they had the bad luck to be phoning around on RTMC weekend, thus finding nobody at home. When I compared their numbers with my own list, I found that their position for Houge and for Henry Coe parks were off by some miles. I rechecked my own, just in case, and added the "old" site at Coe Park, the overflow parking area, half a mile back down the road. I'll include Fremont Peak so that the following list is complete. These are my own determinations, and contain my own errors and assumptions. Accuracy is to plus or minus 1 in the least significant stated digit, except as indicated.

SJAA observing sites

Site name	W. Long	N.Lat	Elev.
Camp Oakes (RTMC)	16°48'	34°13'	~7200
Glacier Pt, Yosemite	119°34.6'0.3"	37°43.5'0.3"	7214
Fremont Peak S.P.	121°30'	36°46'	2700
S.J.B. mission	121°32'	36°51'	~200
Coe, new (upper) site	21°32.7	37°11.3	2670
Henry Coe SP, old site	21°33.0	37°11.3	2640
Grant Ranch Tele.Row	121°42.8'0.5"	37°20.2'0.5"	~1520
Calico Observatory	121°56'18.1"	37°15'44.0"	245
Houge Park	121°56.5'	37°15.4'	~220

I have USGS 7.5 minute maps for most of the greater Bay Area, and coarser maps for most of central California. So if you are seeking co-ordinates, give me a call and I'll try to help. Another place for maps is the Santa Clara city library, who covers all of California at 7.5 minutes, and always has the newest version.

Neuschaefer. They were able to see a number of places that the public does not usually get to go, such as the observing floor and control room of the 120 inch, and the basement where the laser ranging was conducted during the early Apollo Moon program, etc.

The 36 inch telescope was, of course the centerpiece of the tour, and they were given views of Saturn, the Moon, M13, NGC 7009, and maybe others. Consensus: an incredible telescope! There were about 20 people, so there was plenty of time for everyone to get a good long look.

They estimated that the scope was operating at about 500 power, with Saturn filling the middle third of the field. All of us have eyepieces much better than what they were using! We should make a donation!

The coming total Solar Eclipse, Nov. 3, 1994 was the next topic. It crosses Bolivia in South America, and Jack has a friend from there, who would be willing

to lead an expedition! This is a considerable break, as the locals will know far more than any tour guide. Contact Jack if you want to look into this.

At last we got to the regular part of the class! Jack reviewed the constellations from August: Capricorn, then to Aquarius, Pisces, and Pegasus the warped horse. The catch to seeing the "horse" is to realize that the hind legs are actually the two strings of stars that go off as part of Andromeda.

In addition to the regular slides, Jack showed two slide sets that he had purchased up at the Lick gift shop. These were black & white images, absolutely superb photos!

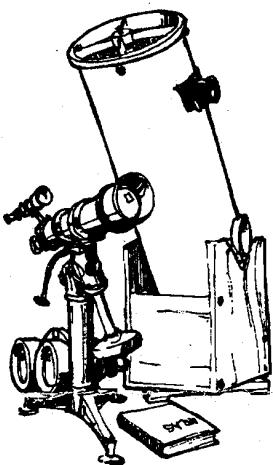
CLASS OUT late, probably about 10 or so.

Reported by Jim Van Nuland,
Secretary, SJAA

1993 SJAA Calendar

General Meeting		Houge Park Star Party	Observational Astronomy Class
Nov	20	19	none
Dec	18	17	none
Jan	22	14	15
Feb	26	18	19
Mar	26	18	19
Apr	23	15	16
May	May be the 14th ?	17	21
June	25	17	18
July	23	15	16

Please read your *Ephemeris* each month for changes



SJAA Loaner Status by Paul Barton

No.	Name	User	Due Date
1	4-1/2" Newt/P Mount	Jim Ricks	12/5/93
2	6" Dobson	Jim Marquis	11/28/93
3	4" Quantum	John Schoenenberger	back soon
6	C-8 Celestron	Stan Stanley	11/7/93
7	12-1/2" Dobson	available	
8	14" Dobson	available	
9	C-11	Available to qualified member	
14	6" Newt/P mount	Craig Mohrman	11/28/93
15	8" Dobson	Lee Courtney	10/29/93
18	8" Newt/P Mount	John Da Silva	12/9/93
19	6" Newt/P Mount	Available	

Solar telescope. Available only to experienced members for special occasions such as day time public star parties, etc. Call.
(on waiting list)

Quantum 4 Chung-Lin Lee
14" Dob Lee Courtney

If you want to borrow a telescope call Paul Barton (number is on the credit Marquee) and get your name on a general list (any telescope) or on a specific telescope list.

ASTRO ADS

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Bob Madden

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Televue Eyepieces - one each 32mm Widefield, 19mm Widefield, 15mm Widefield - all in excellent condition, best reasonable offer for one or all. Call Rich Neuschaefer WK (408) 285-0730 or H (408) 446-0975 9/93

Wanted to Trade: SJAA member and registered mechanical engineer willing to trade services of design, drafting, building and analysis of astronomy gadgets for your skills or services in lathe or mill work, welding, help in electrical systems, programing shareware, or mutual project building. Call Jack Kelly-thorne (408) 335-4806 9/93

Criterion 6" Newtonian, f/7, motordrive, 6X30 Finder, 2 lens: 9mm and 18mm. Excellent condition - \$500. Call Sal Orlando (408) 292-1300 9/93

Owner of 17.5" telescope will share telescope in exchange for transportation to a dark sky site. Can stay over night. (408) 296-0487 1324 Blackfield Dr. Santa Clara. Ask for Mr Thompson

10/93

Celestron C-11, Many accessories \$1750. Mike Ryan (408) 241-4508 11/93

Coulter Optical Odessey 8 Rich-field telescope, Dobson Mount, f/4.5, oversized secondary, extra eye pieces, home made padded transportation cradle - MINT- orig cost \$275 asking \$175 6" Rich-Field telescope - Colter optics, chopper-yellow (cool!) rack and pinion focusing w/eye piece - \$80. Edmund Sci Med to heavy duty GEM - short wooden legs for reflector - \$75. Edmund Sci light duty GEM - long legs for refractor - \$50. Edmund Sci w/aluminum setting circles \$75. Pantax ME Super 35mm SLR camera - 50mm f/2.0 lens - through the lens metering - perfect astro-camera.

MINT! \$150 call Ben Blake (408) 379-5276 leave message if answering machine 11/93

CELESTIAL CALENDAR

November 1993

Lunar Phases	Date	Rise	Transit	Set
LQ	22:37hr	07-11	-----	0621 1302
NM	13:35hr	13-11	0632	1147 1657
FQ	18:04hr	20-11	1217	1804 -----
FM	22:31hr	29-11	1725	----- 0724

Nearer Planets

Mercury	07-11	0622	1137	1652
0.68 AU	17-11	0515	1043	1610
Mag 1.0	27-11	0523	1041	1558

Venus	07-11	0512	1047	1622
1.61 AU	17-11	0558	1056	1616
Mag -4.0	27-11	0535	1106	1614

Mars	07-11	0748	1246	1745
2.425AU	17-11	0744	1237	1730
Mag +1.3	27-11	0740	1229	1718

Jupiter	07-11	0519	1051	1622
6.34 AU	17-11	0450	1020	1549
Mag -1.7	27-11	0421	0948	1515

Saturn	07-11	1329	1845	0005
9.60 AU	17-11	1250	1806	2323
Mag 1.0	27-11	1212	1729	2246

SOL	Star Type G2	V Mag	- 26.72
RA	DEC		
14:51	-16:27	07-11	0638 1151 1705
15:32	-19:07	17-11	0648 1153 1657
16:14	-21:14	27-11	0658 1155 1652

Astronomical Twilight	Dawn	Dusk
JD 2,449,298.5	07-11	0510 - 1833
,308.5	17-11	0519 - 1826
,318.5	27-11	0527 - 1823

Sidereal Time

Transit Right	07-11	0000	PST=0258
Ascension at	17-11	0000	PST=0337
Local Midnight	27-11	0000	PST=0417

Darkest	Saturday Night	Nov 13
Sunset		1705
Twilight End		1833
Moon Set		1657
Moon rise next morning		0742

TIMES AND DATES ARE PACIFIC DAYLIGHT

by Richard Stanton

Times are Local Civil

Derivation of these values are from

Astronomy with Your Personal Computer

by Peter Duffet-Smith

MacEphem

by Elwood Charles Downey

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COMET COMMENTS

by Don Machholtz

Comet Mueller 1993a and Comet Muller 1993p remain visible in our sky this month. They are joined by Periodic Comet Schwassmann-Wachmann 2. It will be closest to the sun on Jan. 23 at 2.07 AU. Comet "SW2" will brighten to only about magnitude 11 on this visit.

EPHEMERIDES

DATE(00UT)	R.A. (2000)	DEC.	ELONG	SKY	MAG
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COMET MUELLER (1993a)

10-20	15h28.5m	+82°32'	93°	E	9.3
10-25	17h19.4m	+80°13'	96°	E	9.2
10-30	18h25.9m	+76°25'	97°	E	9.1
11-04	19h06.2m	+71°51'	98°	E	9.0
11-09	19h33.1m	+66°52'	98°	E	8.9
11-14	19h52.8m	+61°41'	97°	E	8.8
11-19	20h08.2m	+56°29'	95°	E	8.8
11-24	20h20.9m	+51°23'	92°	E	8.8
11-29	20h31.8m	+46°30'	89°	E	8.8
12-04	20h41.5m	+41°54'	85°	E	8.8
12-09	20h50.2m	+37°39'	81°	E	8.9
12-14	20h58.3m	+33°46'	76°	E	8.9

COMET MUELLER (1993p)

10-20	23h55.5m	+39°08'	143°	E	11.6
10-25	23h44.8m	+36°23'	141°	E	11.5
10-30	23h35.0m	+33°22'	138°	E	11.3
11-04	23h26.3m	+30°09'	134°	E	11.2
11-09	23h18.7m	+26°49'	130°	E	11.1
11-14	23h06.9m	+21°14'	121°	E	11.1
11-19	23h01.6m	+17°38'	115°	E	11.0
11-24	22h57.4m	+14°09'	108°	E	10.9
11-29	22h54.4m	+10°49'	101°	E	10.8
12-04	22h52.4m	+07°41'	95°	E	10.7
12-09	22h51.3m	+04°45'	89°	E	10.6
12-14	22h51.0m	+02°01'	83°	E	10.5

PERIODIC COMET SCHWASSMANN-WACHMANN 2

10-20	07h47.7m	+18°29'	91°	M	12.4
10-25	07h55.1m	+18°10'	94°	M	12.3
10-30	08h02.1m	+17°52'	98°	M	12.2
11-04	08h08.8m	+17°35'	101°	M	12.1
11-09	08h15.0m	+17°18'	105°	M	12.0
11-14	08h20.7m	+17°03'	108°	M	11.9
11-19	08h25.8m	+16°49'	112°	M	11.8
11-24	08h30.4m	+16°37'	116°	M	11.7
11-29	08h34.3m	+16°28'	120°	M	11.6
12-04	08h37.5m	+16°22'	124°	M	11.5
12-09	08h40.1m	+16°20'	129°	M	11.4
12-14	08h41.8m	+16°21'	134°	M	11.4

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