

# SJAA EPHemeris

VOLUME 4 NUMBER 6 OFFICIAL PUBLICATION OF THE SAN JOSE ASTRONOMICAL ASSOCIATION JUNE 1993



The Eye Piece  
by Bob Madden

Yes! This month we have Pat Donnelly back with us. As you know Pat is a regular as is Don Machholtz and Richard Stanton.

In my mind the annual auction and swap was a success. A Board of Directors meeting wasn't held this month so it is hard to report what the Association's revenue was. I can say this, a high ticket item was sold - a classic C-8. We want to thank both the purchaser and seller. There were several other big ticket items, such as a Starfire and a Meade ED OTA(s), a Celestron C-8 on a GEM, and a couple C-11(s). We saw many old friends and met some new ones. Leonard Matula from Arbuckle, was there again, so was Steve Greenburg from Livermore and Edward Hyller from Stockton. Ernie Piini drove up from Carmel and had to go back for a star party that night. I even broke down and bought, at auction, a WW-II Bubble Sextant. Why? I'll never know. It must have been Keven Medlock's voice as auctioneer.

I also must say that this past month has been very active for star parties. Quite a few that haven't been reported here. It has been reported before that there is a core group which supports this effort. The participants get

**June 5:** General Meeting 8:00 pm at the Milpitas Library. Board of Directors Meeting 6:15 pm. Edna Devore will discuss the FOSTER Program - teachers flying in the Kuiper Solar Observatory.

**June 12:** No Activity

**June 19:** Star Party at Fremont Peak or Grant Ranch. Moon 2%, Mset 20:24, Sset 20:32

**June 21:** Summer begins  
at 2:01a

**June 25:** Star Party at Hough Park on Twilight Ave. 42% Moon, moon never sets, Sset 20:33

**June 26:** Sixth session of Observational Astronomy, 8 pm at the Milpitas Library.

**July 3:** No activity

**July 10:** General Meeting 8:00 pm at the Milpitas Library. Board of Directors Meeting 6:15 pm. Speaker to be announced.

**July 17:** Star Party at H. Coe or Grant Ranch, 12% Moon, Mset 19:04, Sset 20:28.

**July 23/24:** Star Party at Yosemite. Contact Jim Van Nuland for reservations. This is a party you must go to at least once. There are great skies!

**July 31:** Seventh session of Observational Astronomy, 8pm at the Milpitas Library.

stretched very thin many times. Lately we have called upon Bob Fingerhut, Rich Neuschaefer, and "Crazy" Ed Erbeck. What we need is a back-up list of those names the leaders can call when needed. We know there are many capable amateur astronomers in the Association. Helping on star parties is a way to serve the public and your Association.

This month we have an article by Steve Waldeé on constructing a high-

quality small aperture telescope. Steve has written for the Ephemeris before. This is an interesting article with sources of inexpensive optics. Several of us should try to build what Steve suggests.

## Canyon Lands Field Institute by Edna Devore

Here is an opportunity for the Star Gazers who wish to travel. Von Del Chamberlain is wonderful and is Director of the Hansen Planetarium in Salt Lake City.

A Night Out with the Stars (June 19-20; \$132) takes advantage of warm evenings. Enjoy an expanse of sky teeming with stars, miles removed from the dimming effects of city lights. We'll use unaided eyes, plus binoculars, telescopes, and star charts, to place ourselves in the Solar System, the Milky Way, and the universe. We'll hear celestial tales from various cultures, and learn how ancient peoples interpreted the sky.

Canyons of the Navajo (Oct 17-22; \$925) takes us into another culture and a spectacular landscape. Visit Canyon de Chelly and del Muerto and see ancient Anasazi and Navajo rock art, including many examples of "Navajo Planetariums" better called star ceilings.

Von Del Chamberlain's life work has been interpreting the night sky outdoors, as well as in the classroom. Von Del recently worked as Astronomer and Chief of Presentations at the Smithsonian's National Air and Space Museum.

## Double, Triple, and Multiple Stars

by Patrick M. Donnelly

I thought that I would do something different this month. Since the stars in the sky are either part of a multiple star system or, like the sun, alone in its little part of the universe, it is interesting to realize that there is a classification of stars related to "doubleness".

Based upon how we see these stars, there are over ten (10) types of star related systems. These include:

- Single Stars
- Multiple Stars
- Apparent Binary and Multiple Systems
- Visual Systems
- Astrometric Systems
- Spectroscopic Systems
- Spectrum Binary
- Eclipsing Binary

The remainder of this article describes each of these types of systems.

All stars can be divided into two groups: those that are alone and those that are part of a gravitationally bound multiple system. A multiple star system is any system with two (2) or more stars revolving about the common center of mass of the system. To keep things simple let's refer to these as a (true) "binary system". The sun is considered to be a single star, and Alpha Centauri is considered a binary system. All stars in the sky belong to one or the other group.

When observing double stars in the sky, these stars are called the "Visual Doubles". The visual doubles can be separated into two groups. These two groups are the "Apparent Binaries" and the "Visual Binaries". An apparent binary is two stars that are not physically associated but appear close together on the sky because they lie along the same line of sight. A "Visual Binary" is a gravitationally bound system resolvable into two stars in the telescope. There are two (2) types of visual binaries, those that show an apparent orbit of one star about the other and those close pairs that have the same distance and proper motion. Examples of apparent binaries are Delta Herculis and Vega. There are many examples of visual binaries, including Sirius and Antares.

The remainder of the types are all binary stars. An "Astrometric Binary" is a system with only one visible member, but its oscillatory motion on the sky reveals an unseen companion. Gamma Librae is probably the best known of this type. A "Spectroscopic Binary" is an unresolved system whose secret is betrayed by periodic oscillations in the lines of its spectrum. Good examples of this type are Beta Lyrae and Castor (which by the way is also a triple system). There are also "Spectrum Binaries". These are unresolved systems in which the spectral lines of two different star types are superimposed on the same spectrum. This composite spectrum implies that the system has two components. An example of this type is Capella, that seems to have two other unseen companions. The final type are "Eclipsing Binaries". These stars are spectroscopic binaries that have a variable magnitude due to the components mutually eclipsing each other. The best known of these is Algol.

As a quick final note, the best guess today is that over 55% of all stars in the Milky Way belong to a multiple system of some kind. The existence of the gas giant, Jupiter and Saturn, in our solar system suggest that the sun almost became part of a multiple system.

### Magnitudes

by Bob Madden

The following problem was given by Compuserve, however the story has been changed to make it astronomical.

At a star party one evening a seasoned astronomer was gazing into his eyepiece and said, "Amazing!", just as a young astronomer walked by. The young astronomer asked the older astronomer what he saw. The response was "Three stars". The President of the Astronomical Association had asked the young astronomer to record the magnitude of the stars observed that night, so the young astronomer asked the older one what the magnitude of the three stars were. In response to this question the old and seasoned astronomer said, "The product of their magnitudes is 36 and the sum is equal to the address of the next house." With that gruff re-

sponse the younger astronomer moved down the street to read the next address and promptly came back. He then asked the older astronomer, "I need more information?" The older astronomer said, "The dimmest star is now covered by clouds." Whereupon the young astronomer wrote down the correct magnitudes. What are the magnitude of the stars?

[for those interested in the method of solving this puzzle drop a line with a self addressed envelope to R. Madden, 1616 Inglis Ln, San Jose, Ca 95118-2825]

## Astronomy Day 1993

by Paul Barton

As usual amateur astronomers were out en-mass that day, clear across the nation, at libraries, city halls, parks, road sides, where ever the public could be shown ol' sol through a telescope. SJAA had telescopes and operators at Milpitas Library and Rosicrucian Museum. The day was fine in San Jose for viewing the sun.

At the Rosicrucian Museum were Bob Fingerhut (Questar), Paul Barton (JMI-18, stopped down to 6"), and Jerry McKee (helping). There were a few dozen people over a period of about 6 hours. The sign in list was discontinued after a few pages. Our host was Paul Guinther, Planetarium Director.

At the Milpitas Library were Paul Mancuso, Jack Petersen with several telescopes including the Associations Solar Telescope.

## Santa Clara Sun

by Bob Madden

This solar party was held at the request of John Mendoza, of the City of Santa Clara, and in the plaza near the Municipal Court house. The party was in conjunction with Earth Awareness Day. Dignitaries spoke to approximately 400 first to sixth grade students and teachers. This was followed with hot-dogs, drinks and spun candy. Paul Barton manned the association's solar telescope and this author manned the Questar. *Continued on pg 4*

## **Build a High-Quality, Small Aperture, Wide-field Telescope**

by Steve Waldee

In the smaller apertures under 6 inches, a refractor telescope is apt to offer better performance than a reflector instrument for many applications, although it is difficult to find a source of affordable, quality objective lenses. Long-time readers of the Ephemeris may recall my article from several years back about the joys of "7 mm Exit Pupal Astronomy" with small telescopes. I am happy to be able to report that I have recently located an almost inexhaustible source of excellent "fast" lenses that are useful for constructing spotter scopes, finders, or wide-field, low power telescopes.

Alltronics, at 2300 Zanker Road, San Jose, 95131 (408-943-9773) has purchased several hundred high-quality multi-element lens systems which I have tested for the purposes of constructing astronomical telescopes. The lens assemblies were manufactured by Tomion, and have a focal ratio of f/4.5, with a focal length of 228 mm. The original cost is said to have been \$350, and the price to amateur astronomers is \$39.50. My copy carries an IBM part number, and was apparently used in a high-performance projection system.

Outside aperture of the lens is about 75 mm, with an internal lens stop to improve edge-of-field sharpness. The effective aperture appears to be between 50 and 60 mm, although in my tests, the images were much brighter than several 50 and 60 mm aperture spotters that I compared at equivalent operating powers and exit pupils. Star images over a wide field are absolutely pinpoint sharp when excellent quality oculars are employed.

The six internal elements are all fully multi-coated, and the light transmission appears to be very efficient, since the images are brighter than standard Celestron 8X50 finder scope with a two-element achromatic objective.

I constructed a "richest-field" telescope, using a 32 mm focal length TeleVue Ploessl ocular, providing a 7 mm exit pupil for maximum transmission of light to a dark-adapted eye. Using this

instrument, I was able to spot many of the "dark nebulae" in the Milky Way from the constellations of Cygnus through Sagittarius, and was very pleased with the image quality of the starfields.

Using the Lumicon light-pollution and nebular filters, I obtained beautiful, high-contrast images of deep-sky nebulae such as M8 ("Lagoon") and M20 ("Trifid") while observing in the Loma Prieta mountain range south of San Jose. The short focal length of the lens system makes an ideal low-power telescope for daytime observing or night-time wide field sky sweeping, or for low-power views of the moon or large open star clusters like M44 ("The Beehive") or M45 ("The Pleiades"), objects that are difficult to observe in a normal astronomical telescope due to the extremely wide field of view required.

The lens cell is very massive and substantial, with an outside diameter of 91 mm (3-5/8") and a length of 104 mm (4-1/8"), weighing about 7 lbs, almost twice the weight of the typical 8X50 finder scope. Users of large Dobsonian telescopes may find it convenient to mount this heavy lens system on the box for the primary mirror cell rather than at the eyepiece-end of the telescope. I fashioned a small threaded bracket to attach the lens to my camera tripod for convenient portable day and night use.

Experimenters with access to metal-working tools may prefer to fabricate a tube assembly to couple the lens system to an appropriate focuser tube for the eyepiece. However, I fabricated a "cheap-and-dirty" instant assembly that can be put together in a few moments from parts purchased over the counter at Orchard Supply Hardware.

The outside diameter of the cell is unfortunately a tiny bit larger than the inside diameter of convenient 3" ABS plastic plumbing attachments. However, I found that a combination of "Agriflow" fittings and plumbing fixtures could produce a sturdy assembly which comfortably and safely holds a standard 1.35" diameter astronomical eyepiece.

The following parts are available at all OSH outlets, and will fit the lens system and an eyepiece. Attach a 3" Agriflow fitting (OSH Part # 604-6866, cost \$1.29) to the end of the lens assem-

bly; since the lens system design is symmetrical, either end will be satisfactory. Fasten tight with a 4.5" hose clamp.

At either end of the Agriflow fitting, insert a 1-1/2" to 2" pipe increaser (OSH Part # 144-6624, cost \$1.29), which may be either glued in place or held with another hose clamp. Insert a male 1-1/2" trap adaptor with washer and nut (OSH Part # 144-7259 cost \$.99) to hold the ocular. A standard 1.25" diameter eyepiece will fit perfectly in the washer when the nut is slightly tightened. Take care to assemble the items so that the optical axis is straight from objective lens to eyepiece, and focus by pushing or pulling the eyepiece in or out of the washer/slip joint.

The image of this arrangement will be upside down and inverted as presented by a typical astronomical telescope. If you desire an upright image for day time use or for correlation with a star chart, you should obtain a diagonal prism or mirror.

It will be necessary to shorten the physical length of the system a couple inches to compensate for the extra length of the diagonal system. Simply cut off two or more inches of the Agriflow fitting and re-tighten the hose clamp, while adjusting the eyepiece for the correct focus. A star diagonal prism or mirror will have an upright but reversed image, while a fully corrected image will be provided by an "Amici" or "Porro Prism" system, which may require a slightly longer focal length.

Diagonal attachments and eyepiece lenses are available at telescope dealers such as Lumicon in Livermore (510-447-9570) or Orion in Cupertino (408-255-8770). To obtain the best quality image with a lens of such a short focal length, I suggest using low to moderate powers of magnification from about 8 to 60 power, as provided by oculars of 32 to 4 mm focal length. At this magnification range in a dark night sky, many deep-sky galaxies, star clusters, and nebulae will be quite visible. Planets, however, would be better observed with a longer focal length lens system at higher magnifications.

With a 24.5 mm Meade eyepiece, I measured a field of view of the

*Continued on Page 4*

## **Build a Richest Field Telescope**

*Continued from Page 3*

complete telescope system that was about 7.5 degrees, providing a beautiful wide field of pinpoint stars, a veritable "picture window" on the sky.

Finally, if you observe during moist nights when dew is likely to form, I suggest attaching a "dewshield" to your lens. A 4" coupler (OSH Part # 145-6391, cost \$1.79) will handily do the trick.

If you have an IBM-compatible computer with at least 256K of memory, you may obtain a shareware program that will help you compute all the operating parameters of any astronomical telescope such as the above home-made system. The author's program "SHARESCOPE" is available at Luminicon for \$3.95, or by mail order for \$5.95 to cover postage and handling from Allerstro Music - Software Division, at 1468 Kimberly Drive, San Jose, Ca., 95118.

## **Observational Astronomy Class**

by Paul Barton

Jack Petersen started his discussion with "Why our Milky Way (our galaxy) is fainter in the winter than in the summer — we are looking away from the bright center in winter and towards the center in summer.

Next was a discussion of the Hertzsprung-Russel graph of spectral classes of stars (OBAFGKM). This is a graph of the life-temperature of a normal star, from low temperature beginning (type M) to high temperature explosion and finally dying as a brown or black dwarf. This occurring over a period of billions of years. Our sun is class G, about 5000° K and has perhaps 5 billion years before it's hydrogen fuel is consumed and collapses, then explodes into a super nova hundreds of millions of miles across. At that time the sun will engulf all of its planets, including our earth. (See page 85 Vol 1 Burnham' Celestial Handbook)

Betelgeuse and Antares were revealed as thin gassy monsters, as thin as very fine laboratory vacuum, but hot and about 500 times the size of ol' sol.

Jack followed with star charts and photo-slides of the spring galaxies

including Leo, Leo I and II, Coma Berenices, Virgo, Hydra, Cannes Venatici, Cancer, etc.

Those in attendance were:

Alex Calderon  
William J. Calderon  
Bill O'Shaughnessy  
David Lin  
Grace Lin  
David Simons  
Albert Chen  
Ben Lee  
Jim Cook  
Jim Ratcliffe  
Marg Ratcliffe

## **Research In Search of the Lensless Camera**

By Bob Madden

I couldn't resist this. Many of you have, by now, read the article in **Astronomy** on making and using a lensless Schmidt camera. My interest in a device similar to the Schmidt, a Lensless Wright camera goes back several years. Jordan Marche' wrote an article edited by Roger Sinnott in Sky & Telescope, April 1988, page 432, where he discussed the design, construction, and performance of an 8" Lensless Wright. In fact I wrote to Mr. Marche' to obtain more detail on his photographic camera mount and how it is placed in focus. In fact, I convinced Bob Elsberry to construct his first telescope, a 5-1/2" around this design. Bob's is in a visual configuration however. While all this was taking place, Jeff Horn was also constructing his Lensless Wright, an 8", but for photographic work. Both telescopes were shown at last September's equipment night. Since then Jeff has made some adjustments and is obtaining some very satisfactory photographs, by my standards anyway.

Marche' in his article referenced Ingalls' Amateur Telescope Making II (ATM) book. Beginning on page 401, Franklin B. Wright, of Berkeley, Ca, gives a dissertation on these types of cameras - where aperture stops are used to flatten the focal surface. In fact corrector plates are also discussed. In all of these cases short focus spherical mirrors are used - from f/1 to f/3. One must remember that a spherical mirror is one of the

easiest to make.

Now enter The Astronomy magazine article in the May issue. I had missed mention of this configuration in ATM II. Bob Elsberry got one of the 5 and 1/2" mirrors, one I sent to Lech Jaszkowski in Poland, and I have two left. I now have plans to construct a Lensless Wright and a Lensless Schmidt for comparison in visual work. I have gleaned that the aperture placed at the focus will still have some curvature of the focal surface. I'm not sure about the Lensless Schmidt where the aperture is placed at the radius of curvature. Stay tuned and I will ask for comments from Jeff and Bob as we go along.

## **Unusual Star Party**

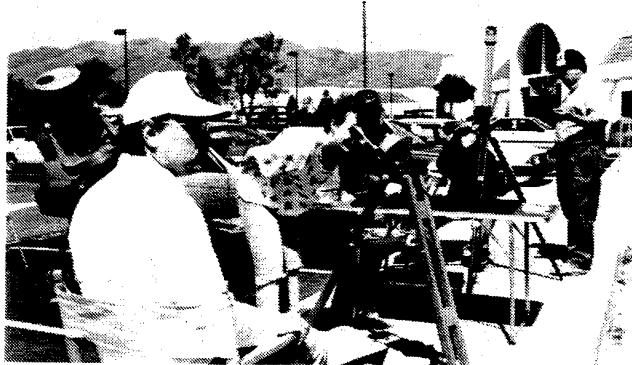
By Paul Barton

Fremont Peak, Monday Night, 26 April 1993

There was a fire in the hills west of Gilroy that filled the valley with smoke. (You could smell it on highway 101). Just after dark, about 9pm, lights of Moss Landing and Watsonville were invisible. Later they could be seen through the hazy smoke. The result was DARK at the Peak. VERY DARK. The atmosphere was fairly stable — no twinklers, a first quarter moon, which went down at midnight. The temperature was 44° to 46° and dry.

Seeing was only fair due to the smoke. I could not see Corvis or Crater visually, but with the telescope up I could see magnitude 12 objects. The night was used going down through Virgo. What was so unusual was the complete quiet. There were no visitors, no lights, no cars, no raccoons and no sprinklers. We were in a dark quiet world of our own. In attendance were myself and "Lady".

**Santa Cara Sun (Continued from pg 2)**  
About 100 students were interested to look in the telescopes. Many of the other support groups (adults) also stopped in to view the sun, including several members from the California Conservation Corps. Actually the sun didn't have much activity, but there were two sun spots. After four hot-dogs for Paul and five for myself we packed up and went home, the time - 11:00a thru 2:00p.



Astronomy Day at the Milpitas Library



The Auctioneer at work



All Photographs by Bob Keller

#### More Astro Ads

**Televue 24 MM wide angle eyepiece - new condition - \$100** **Cold Camera**, Rudy Kokich, for 35 mm roll film - new condition - \$100 Dr. Kenneth Lunan, 1064 Broadway Ave, San Jose, Ca 95125 6/93

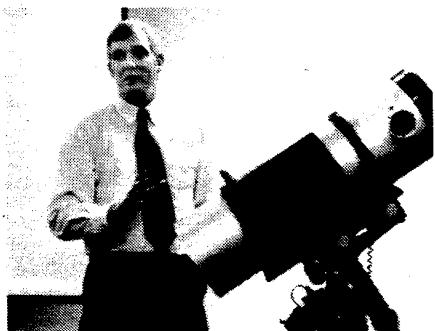
**8" Dia handmade lens, 6" Dia lens, and smaller eyepiece lenses.** Call Ms. Marina Luisa Green Mond-Sun Noon till 10 PM (415) 366-2847. Allow for many rings!

6/93

**Meade 8", W/Starbright coating, German Eq Mt.** Metal accessory case, 26mm, 40mm, 13mm eyepieces. Piggy-back camera mount, T-ring camera adapter, and eyepiece projection system. Great telescope at \$1200 for everything. Call Maria Petersen at (408) 262-1457. 6/93



Ron Sheldrup displaying his SKYPORT last month



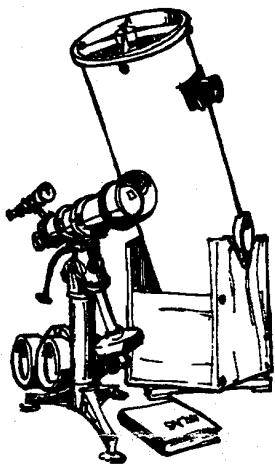
Rick McWilliams with his unique 8" Maksutov and discussing his Digital Setting Circles



**1993 SJAA Calendar**

General Meeting	Houge Park Star Party	Observational Astronomy Class
June 5	25	26
July 10	23	31
Aug 14 Picnic	20	28
Sept 4 Slide/Equip night	24	25
Oct 2	22	30 Last one
Nov 20	19	none
Dec 18	17	none

Please read your *Ephemeris* each month for changes



**SJAA Loaner Status**  
by Paul Barton

			Due Date
4-1/2"	Newt/P mount	Bud Whittlin	5/25/93
6"	Dobson	Dave Simmons	4/14/93
4"	Quantum	Nagin Cox	7/08/93
60mm	Cometron Ref.	David Liao	6/18/93
C-8	Celestron	John Schoenenberger	6/17/93
12-1/2"	Dobson	I Courtney	6/04/93
14"	Dobson	Richard Raw	6/04/93
6"	Newt/P mount	D. Petree	5/24/93
8"	Dobson	Mark Wagner	6/04/93
8"	Newt/P Mount	Albert Chen (on waiting list)	5/21/93
	Chung Lin Lee	Any	
	Gabriel Stoll	Any	
	Bob Dow	Any	
	Bill and Lana McClure	Any	
	David Liao	Quantum 4	
	Nagin Cox	8" Newt/P Mount	

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

**ASTRO ADS**

ASTRO ADS are free to all noncommercial advertisers wishing to sell astronomically related products or services. Please send your ad directly to the Editor: Bob Madden  
1616 Inglis Lane  
San Jose, Ca. 95118-2825  
**NO LATER THAN THE 12th OF EACH MONTH!** Your Astro Ad will run approximately 3-months.

Celestron SPC 80 Refractor, Super Polaris Mount W/"Pole Finder", 26mm Plossl, 8mm RKE eyepieces, 3 years back issues '**Astronomy**' Mag. All equipment in new condition - \$400. Contact John Felch (408) 741-0880 4/93

**NOTICE**

**YOSEMITE STAR PARTY**

The Yosemite Star-party will be conducted on July 23rd and 24th at Glacier Point, which will have Sset at 8:19, Mset at 10:45 and 11:31; morning twilight is at 4:21. So there will be 5h 26m and 4h 50m of fully-dark time. The public will occupy much of the moon time. At Moon set Friday, Sagittarius is well clear of the trees.

**PLEASE CALL  
BOB MADDEN AT  
(408) 264-4488 FOR  
YOUR RESERVATION.  
LEAVE YOUR NAME  
AND TELEPHONE  
NUMBER WHERE YOU  
CAN BE CONTACTED**

When Jim Van Nuland returns he will contact you

## CELESTIAL CALENDAR

June 1993

LunarPhases	Date	Rise	Trans	Set
FM 06:02hr	04-6	2038	0126	0613
LQ 22:37hr	12-6	0046	0648	1247
NM 18:53hr	19-6	0536	1248	2004
FQ 15:44hr	26-6	1315	1856	0039

### Nearer Planets

Mercury	07-6	0652	1433	2217
0.82 AU	17-6	0725	1444	2207
Mag -1.80	27-6	0726	1428	2133
Venus	07-6	0330	0959	1632
0.76 AU	17-6	0320	0958	1640
Mag -4.2	27-6	0313	0959	1650
Mars	07-6	1025	1718	0014
1.90 AU	17-6	1015	1701	2350
Mag +1.50	27-6	1006	1645	2327
Jupiter	07-6	1415	2013	0214
5.21 AU	17-6	1337	1935	0135
Mag -2.1	27-6	1301	1858	0058
Saturn	07-6	0036	0557	1116
9.35 AU	17-6	2357	0517	1036
Mag +0.8	27-6	2319	0437	0956
SOL Star Type		G2V	Mag -	26.72
RA DEC				
0507 2248	07-6	0546	1307	2027
0571 2324	17-6	0545	1309	2032
0634 2318	27-6	0548	1311	2033

### Astronomical Twilight

JD 2,449,145.5	07-6	0352	-	2221
,155.5	17-6	0350	-	2226
,165.5	27-6	0352	-	2228

### Sidereal Time

Transit Right	07-6	0000	PDT=1555
Ascention at	17-6	0000	PDT=1634
Local Midnight	27-6	0000	PDT=1714

### Darkest Saturday Night June 19

Sunset	2032
Twilight End	2227
Moon Set	2024
Moon rise next morning	0525

**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

The unusual Periodic Comet Shoemaker-Levy 9 remains near Jupiter. It is quite faint, but you might want to try looking for it. Meanwhile, one faint comet has been recovered.

Periodic Comet Reinmuth 2 (1993g): Jim Scotti of the Lunar and Planetary Laboratory at Kitt Peak recovered this comet on Feb. 26 at magnitude 22. It is a year from perihelion but will not be visible in amateur telescopes.

## EPHEMERIS

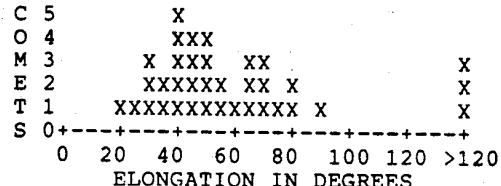
DATE (00UT)	R.A. (2000)	DEC.	ELONG	SKY	MAG
PERIODIC COMET SHOEMAKER-LEVY 9 (1993e)					
05-23	12h06.4m	-01°57'	120°	E	13.2
05-28	12h06.2m	-01°55'	115°	E	13.2
06-02	12h06.3m	-01°56'	111°	E	13.2
06-07	12h06.7m	-01°58'	106°	E	13.3
06-12	12h07.4m	-02°02'	101°	E	13.3
06-17	12h08.4m	-02°08'	97°	E	13.3
06-22	12h09.6m	-02°15'	92°	E	13.3
06-27	12h11.1m	-02°24'	88°	E	13.4
07-02	12h12.8m	-02°35'	84°	E	13.4
07-07	12h14.7m	-02°47'	80°	E	13.4

## Seeing Comets

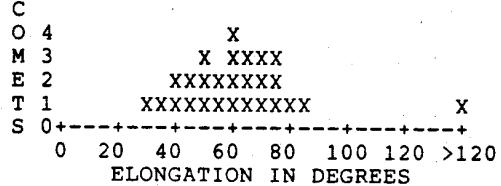
At what elongations (distance from the sun in degrees as seen from the earth) are comets discovered? Here we examine the 36 comets visually found in the morning sky, and 27 comets found in the evening sky between 1975 and 1992. The number of degrees is written along the bottom, each "X" represents one comet discovery elongation.

The morning average was 59.1 degrees with a median of 49 degrees. The evening average was 62 degrees with a median of 63 degrees. This doesn't demonstrate just the behavior of comets, but also the behavior of comet hunters, who tend to concentrate on areas within 90 degrees of the sun.

### MORNING SKY ELONGATIONS



### EVENING SKY ELONGATIONS



**EPHEMERIS** is published monthly by the San Jose Astronomical Association - 3509 Calico Ave., San Jose California 95124. Members are encouraged to submit articles for publication. These should be typed and submitted no later than the 12th of the previous month. All submissions should be sent to the editor, Bob Madden, 1616 Inglis Lane, San Jose, California 95118. A text file on a 3-1/2" IBM or MAC diskette is preferred, but written is accepted.

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