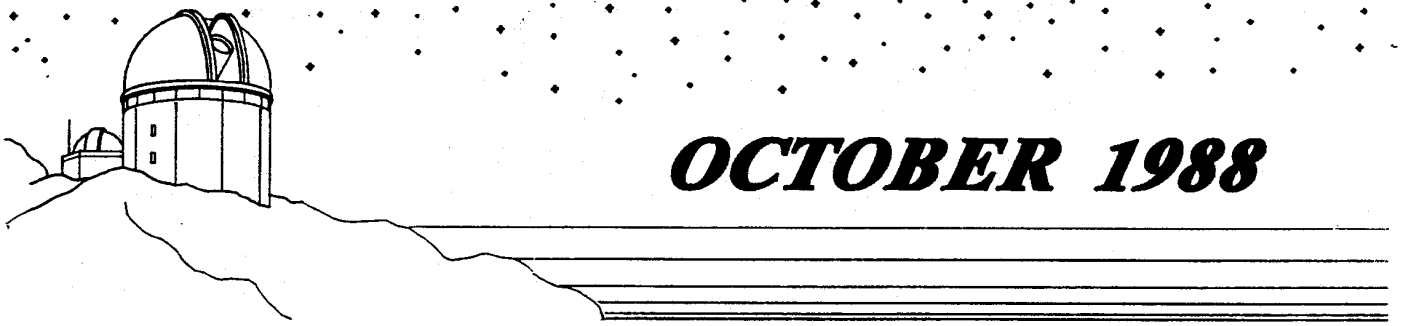
# EPHEMERIS

## OF THE SAN JOSE ASTRONOMICAL ASSOCIATION



# OCTOBER 1988

**OCTOBER 1ST**
**ERNIE PIINI PRESENTS:**
**"ECLIPSE OVER BORNEO"**

| | | |
|---|---|---|
| SEPT | 30 | MARS WATCH, BRANHAM LANE CITY PARK. SUNSET 6:46 PM. NO MOON. MARS IS UP AT 6;52 PM. |
| OCT | 1 | ERNIE PIINI REPORTS ON "ECLIPSE OVER BORNEO". SLIDES AND SOUNDS OF THE TOTAL SOLAR ECLIPSE OF MARCH 18, 1988. THERE IS ALSO A MARS WATCH SCHEDULED AT BRANHAM LANE CITY PARK. |
| OCT | 7,8 | MARS WATCH CONTINUES AT BRANHAM LANE CITY PARK. SUNSET AT 6:37 PM. NEW MOON. MARS UP AT AT 6:23 PM. SATURN IS WELL UP. |
| OCT | 8 | STAR PARTY AT FREMONT PEAK STATE PARK. SUNSET AT 6:34 PM, ASTRONOMICAL TWILIGHT ENDS AT 8:05 PM. MORNING TWILIGHT AT 5:43 AM. NEARLY NEW MOON RISE AT 6:02 AM. |
| OCT | 15 | STAR PARTY AT GRANT RANCH COUNTY PARK. SUNSET AT 6:25 PM, 25% MOON SETS AT 9:23 PM, ASTRONOMICAL TWILIGHT WOULD END AT 7:56 PM. MORNING TWILIGHT AT 5:49 AM. |
| OCT | 21, 22 | MARS WATCH, BRANHAM LANE CITY PARK. SUNSET 6:18 PM, NEARLY-FULL MOON WELL UP. MARS UP AT 5:18 PM. 12 DEG. UP AT SUNSET. |
| OCT | 22 | BOARD MEETING AT TOM AHL'S HOUSE, 5:00 PM SHARP. THIS IS EARLY ENOUGH TO GET OVER TO BRANHAM LANE PARK BY SUNSET. 1260 BUTTERFLY DRIVE, OFF FIREFLY BETWEEN REDMOND AND CAMDEN. |
| OCT | 22 | LAST SESSION OF THE INTRODUCTORY OBSERVATIONAL ASTRONOMY CLASS, RED CROSS BUILDING AT 8:00 PM. |
| OCT | 28, 29 | MARS WATCH AT BRANHAM LANE CITY PARK. SUNSET AT 6:10 PM WITH MARS 16 DEG. UP. PAST-FULL MOON RISES AT 8:52 PM. |
| NOV | 5 | SHILOH UNRUH, LICK OBSERVATORY HISTORIAN, SPEAKING ON CHARLES FEIL, THE GLASS MAKER WHO PRODUCED THE BLANKS FOR THE LICK 36" CLARK REFRACTOR. |
| NOV | 19 | BOARD MEETING AT THE RED CROSS BUILDING, 6:30 PM. TO BE FOLLOWED BY AN INDOOR STAR PARTY. THERE WILL BE A SHORT DISCUSSION OF THE UPCOMING GRAZING OCCULTATION OF REGULUS. AFTER THAT, ENJOY SOME GOOD VISITING. ANY QUESTIONS YOU'VE BEEN WAITING TO ASK? |

## FIELD OF VIEW
## BY: JOHN GLEASON

### ECLIPSE OVER BORNEO

Our own "globe trotting" Ernie Piini will present his latest report on the March 18th total solar eclipse as witnessed from Borneo. Ernie's wit and

entertainment style always insure us of a wonderful evening. Don't miss it! October 1, 8 pm at the Los Gatos Red Cross building.

### SWAP MEET AND SLIDE/EQUIPMENT NIGHT

According to Jim Van Nuland, the Swap Meet went well. The club earned about $110, so sales were good. The feeling was that we probably should continue them. Following later in the day was the slide and equipment presentation that had a goodly number of telescopes with many fine slides.

The highlight of the evening was John Briggs' report on some research he's been doing into early telescopes, in particular, those built by C.A. Robert Lundin (pronounced lunDEEN), who worked for the Clarks and later ran his own factory. It is probable that he did some of the figuring of the Yerkes 40 inch refractor. John contacted Lundin's daughter, who, it turns out, knew little of her Father's business, but did have a few bits of memorabilia of the Clarks, including some pen-and-ink drawings done by Alvan Clark! She sent them on to John, who showed them around. He is continuing his study.

### ASTRONOMY AND TELESCOPE MAKING MAGAZINES

The renewal period for Astronomy and Telescope Making magazines will close at the end of the November 5 General Meeting. Astronomy costs $14; Telescope Making, $8 for one year (12 or 4 issues, respectively). If you presently subscribe through the SJAA, you may send a check, preferably including a mailing label, to Jim Van Nuland, 3509 Calico Ave., San Jose, CA. 95124. Make a check payable to Jim Van Nuland, not the SJAA!!!. New subscriptions will begin with the January issue of Astronomy, and with the next issue of Telescope Making.

If you presently subscribe independently, you may convert to the group rate only if you subscription expires during 1989. Send a mailing label and enough $$$ to cover the remaining part of the 1989 subscription. Your subscription will be extended to synchronize it with the group renewal (calendar year).

### MARS WATCH - '88

Don't forget that the SJAA is continuing to hold its series of public star parties at Branham Lane park. Please note the specific dates in the Ephemeris calendar. Mars never looked better. This is your chance to show-off your astronomical expertise to the public.

### PERSEID METEOR SHOWER

Jim Van Nuland reports, "Although fog threatened to swallow Fremont Peak on August 11-12, the sky cleared about dark and we were treated to a fine show. Humidity remained extremely high, so little photography was attempted, but the handful of stalwarts were amply rewarded for their efforts. Due to some passing clouds, it was not practical to make counts, but the feeling was that we probably were seeing at least one a minute. We were eventually clouded out about 3 am. Other observers report that there were nearly as many meteors during the preceding few days, indicating a very broad peak. This is one of the most reliable meteor showers, and, coming when the weather is (usually) good, and very well observed. It deserves the attention!"

## CUB REPORTER AT LARGE
## BY: BRIAN ZEHRING

### FPOR STAR'BECUE AUGUST 13TH

Duncan and I arrived a the Peak around 3 o'clock and it was pretty windy with fog threatening to the East and West.

I was treated to a spectacular view of the Sun through Bob Fingerhut's hydrogen-alpha filter. There were many sunspots with granulation easily visible. Later around 5 pm we had some superb hamburgers (my compliments to the chefs). At 8 pm Chris McKay from NASA gave an excellent talk on Mars.

Kevin Medlock has set up an 8-inch refractor for the next 6 weeks to show the coming opposition of Mars and it is positioned in front of the 30" observatory. I regret not seeing Mars through it, but I did get a great view of Saturn.

Around 9:30 pm we took the mirror cover off the 30" and looked a the Lagoon nebula. Later we saw the Andromeda galaxy, M33 in Triangulum, the Double Cluster, and M13. Around 1 AM the fog rose and blanked out the sky to everyone except at the observatory. There were just three of us there so I decided to turn it to the Ring nebula and maybe catch a glimpse of the central star.

After a few minutes worth of searching we had found it. I put in a high-power eyepiece and was able to see it after a couple of minutes using averted vision. I got down to turn the telescope to M27 when we noticed the finderscopes and secondary were heavily dewed. We decided to close the observatory and rolled back the roof.

I made my way back to Coulter Camp where the fog had lifted but telescope were rendered useless because of dew. We decided to leave around 3 am.

## CLUB OBSERVATORY

About 8 years ago the club entertained the idea to build an observatory and we set up a membership drive and other fund raising events such as the auction. Response was very good and each year our funds grew. Now we have some money and are looking for a site.

One possible site is Mt. Uminum; a site we used for 5 or 6 years for club star parties. It fell into disuse because of the degraded condition of the access road (bullets were also considered a problem).

Just recently we got in touch with the Mid-peninsula Open Space District who controls the road access rights and property rights to land up by the old Air Force radar station. We have drafted a request for its use.

## AN OVERVIEW OF OBSERVING SITES
## BY: DON MACHHOLZ AND RICH PAGE

Two years ago Rich and I set out a map of the Bay Area and identified two dozen potential observing sites for this series of articles. Since then we've taken numerous trips over many miles lasting many hours. This is our last installment, and rather than reviewing a site, let us wrap up the series with some notes and news.

Living in this area has a curse and a blessing. Although we have a vast amount of night-time light, we are "rimmed" by mountain ranges which can take you up and away from the lights. We concentrated on these areas. All told, we've reported on 16 sites in 14 articles.

Every visit to a site is accompanied by measurements, conversation and debates. We often went to each good site twice, once in the daytime-this is to find potential set-up spots, then again at night-to check out observing conditions. Some places looked so bad in the daylight that we removed them from our list. At good sites, Rich would measure horizons with his homemade horizon-scope, interview park rangers or neighbors. The night-time session include light pollution checks and more traffic counts. We always kept in mind what, you the observer, would want to know about a site before visiting it.

There have been changes in some sites since we wrote them up. To observe from Saratoga Gap you should call Quinton Kay (408) 338-6132 first. Also, Weaver Road is windier than we had thought.

We also learned that some of our elevations were off. Rich's new topographic map shows us that Rodeo Gultch Rd. is 860' high, while Bear Creek is at 2050', Saratoga Gap is at 2215' and Weaver Rd. is at 2100'.

Here are some sites that did not make it into the series. I can provide more details for those interested.

Loma Prieta (Mtn.): An often-locked gate to discourage traffic has prevented large-scale use for Astronomy.

Lower Loma Prieta: Off Summit Rd. and well-placed, this site is too small and has too much strange traffic to deserve its own write-up.

Boony Doon: We've heard that this is a dark site but we've also heard that you need prior arrangements and special permission to use it.

New Idria: A dark site, but we considered it too far for most SJAA members.

Sanborn Canyon Park: You can observe from either the picnic area or the camping area, but the gate is closed from dusk to dawn, making quick trips to this close site impossible.

Calaveras Res.: We found a small site at the end of Marsh Rd., but it is near a farmhouse and we couldn't contact the residents.

Mt. Diablo State Park; A bit far for most SJAA members, this site also suffers from a locked gate at night and reports of light pollution. We've yet to visit it, and if it's good we'll give notice in the future.

Twin Creeks: A group of punks chased us out of here.

We were impressed by the large size of the "Brickyard", near Lick. Also surprising was the massive size of the Uvas Res. parking lot, and the dark skies at San Felipe Rd. I think we disagreed most on Fremont Peak, and agreed most on the unsuitability of Twin Creeks.

If there is interest, I can re-print these articles in booklet form and sell at cost. And, since this is our last site review article, perhaps someone else, (not us) could write a series of reviews of the planetaria, astronomy stores, or "large telescopes accessible to the amateur" in this area.

I wish to thank Rich Page, who is not only a good friend and astronomer, but also has a sense of humor and level-headedness which has always helped me. I also thank my wife and son, they went to almost every site with us. Thanks to Mark Mattox and Darwin Poulos for their input, and to John Gleason who re-typed these for the bulletin.

We only hope that one of these sites will become your favorite site.

## ASTRO ADS

FOR THE ASPIRING ASTROPHOTOGRAPHER. Classic Orange Celestron C8 with wedge, adjustable tripod, and everything you need for astrophotography except a camera. Equipment includes : Accutrack 2120 dual axis drive corrector with joystick hand controller and declination motor, Jim's Mobile electric Motofocus, 8X50mm finder, setting circle lights, work table, counterweight bar assembly, dew shield, off-axis guider plus 12.5mm Orthoscopic illuminated reticle eyepiece for deep sky astrophotography, tele-extender tube for close-up planetary and lunar photography, piggyback camera mount for wide-field astrophotography, 10mm Plossl and 25mm Orthoscopic eyepieces, 2X Barlow, accessory case, The Amateur Astronomer's Handbook, 3rd Ed., Webb Society Deep-Sky Observer's Handbooks, Vols. 1 to 5, The Cambridge Astronomy Guide, plus more! Asking $1795. Contact Ron at 415-278-3335 for details. Evenings, before 9:30 PM, please. 10/88

BAUSCH & LOMB 60mm telescope. Telescope is only 5 months old and in excellent condition. $190 For more specific details contact: Gary Mathers 408-286-4004, 707-576-0778. 10/88

CELESTRON Super C8+ with tripod and wedge. 1 year old, mint condition, original boxes. Includes 2.5x Televue Barlow, dew cap, star diagonal, 2 eyepieces, etc. Paid $1200: will sell for $900 or best offer. Contact: Brett Johnson at work 408-553-2965 or home 408-293-2053. 10/88

MEADE 2080 with tripod and wedge. This is a fully equipped 8-inch catadioptric telescope with lenses, motor, and many accessories. It is not a stock telescope, but a special instrument provided by the vice president of Meade for astrophotography by personal request. It has superfine resolution and the best optics available for its size. It comes with case, dew heater, many Erfle, Plossl, wide-angle, etc. eyepieces. Best offer. Call Dave Klausner, 737-5260. 9/88

SKY & TELESCOPE collection for sale. 340 issues of S & T from years 1944 through 1978. Mostly fair to excellent condition. The whole lot will go for $295. However, if anyone cares to make an offer above this figure will be given preference. Shipping anywhere in the continental USA is included in the price. Interested parties who wish to communicate further on the matter may write to: William Hunkins, 124 Columbia Heights, Brooklyn, NY, 11201. Or you may phone at (718) 625-3600, preferably Monday evenings, 8 - 9 PM EST, Saturday afternoon or evening before 9 PM EST, or Wednesday evening, 6 - 6:30.

FOR SALE - Celestron SP-C6 complete with Celestron Dual Axis drive, 26mm, 13mm, and 6mm eyepieces. Also, Parks 2x barlow and Cannon T-adapter, carrying cases (2) - $875 or best offer. Celestron 10 X 50 binoculars - $80. Contact Jim at P.O. Box 988, Pittsburg, CA. 94565 or 415-625-2832. 8/88

EMPLOYMENT OPPORTUNITY - Finial Technology is a start-up company developing the first Laser Turntable. They are seeking an optical systems engineer with 5+ years of experience in the design and development of optical systems. Ideally, you have had hands-on experience with the development of laser diode based optical systems and understand how to specify, mount, and align standard optical components. They are looking for a self starter who can take a lead

role in the current product as well as future products. Please send your resume to: Finial Technology, Inc. 707 East Evelyn Ave. Sunnyvale, CA. 94086 8/88

## COMING: GRAZING OCCULTATION EXPEDITION BY JIM VAN NULAND

Wednesday morning, November 30 will see a graze of Regulus across the Bay Area. We are planning our major expedition in the vicinity of Patterson, off Hy.5 in the Central Valley. Smaller expeditions may be launched near Belmont, and south of Fremont.

What is a grazing occultation, you may ask. "Occultation" means that something is getting in the way, or hiding, another astronomical object. In the present case, the moon is moving in front of Regulus. Since the moon is smaller than the Earth, the occultation does not occur everywhere, so there is a line across the Earth that defines the boundary between the occultation and the miss. Since the moon has an irregular outline, there will be a zone about 3 miles wide, in which the star will be hidden only by the mountains on the moon's limb, but will be visible in the intervening valleys! This is the grazing zone, and with the Regulus event, the zone starts in the Bay Area, then continues east-southeast to cross Arizona, New Mexico, and Texas.

The observer, positioned within the critical area, will see the star disappear and reappear one or more times, depending on the particular heights of the lunar mountains, and on the observer's exact position (graze height). So each observer will see a somewhat different sequence, from a single long extinction (near the bottom), or a dozen events (if lucky), to a single short extinction at the very top of the lunar mountains. The actual observing run is typically 10 minutes or less.

All these observations can be combined to yield a detailed outline of the Moon's limb. The result is a very precise measure of the moon's position and shape, as well as a precise measure of the observer's and the star's positions.

Observing a graze is not difficult, but you must pay careful attention during the observing run. You call out what is happening, instant by instant, into a tape recorder. During all this, you have a short-wave receiver, tuned to the WWV time broadcast, also recording time signals onto the tape. Afterward the tape is played back, and you listen to the time ticks, to the shouted calls of OUT and IN, to determine exactly when the events occurred. After a few passes, you can readily determine the times to a few tenths of a second. The graze leader will have determined the telescope positions to corresponding accuracy, and will put the whole together for reporting.

So, look around and find your short-wave WWV receiver and your battery tape recorder. At work, ask for vacation on Nov. 30 so you can sleep late after the graze. Jim Van Nuland will talk about grazing at the Red Cross on November 19, following the Board meeting. Technical details will be given next month.

## GREAT RED SPOT
## BY: JIM VAN NULAND

Though I was able to recover the Great Red Spot of Jupiter on June 22, I held off starting these articles until there would be some more observational opportunities. At recovery, the Spot was only three minutes away from the predicted time, and only 92 days since the final timing of the previous season. This is far sooner than ever before, usually it's been 160 to 180 days.

Subsequent observations have shown a well-defined Spot during moments of good seeing. The Red Spot Hollow is very easy to find, pushing about a third to half a Spot-width into the southern edge of the South Equatorial Belt, with dark belt material to the east and west. The South Temperate zone is nicely white, so the Spot shows well against it during moments of best seeing. The dark rim that had run south of the Spot has faded, so the edge of the Spot is no longer outlined on the side away from the SEB. Color remains elusive, as it has for many years now, however, moments of good seeing show some orange or pink.

During the early 1970s, the Spot was brick-red, separated well from the belts, so it was very easy to see. The late 70s were very poor; for a full year I never saw the Spot at all! Yet the dent in the SEB was visible, so I timed that, and published predictions of the Great Dent of Jupiter! Though still not as easy as the olden days, the Spot is a lot of fun to see. Things change during the year, so you should check out the Spot frequently to be aware of

current conditions.

Discovery of the Great Red Spot is credited to Giovanni Domenico Cassini in 1665, though there are drawings with possible indications as early as 1635. The Spot was given little attention, as it soon faded. It first gained general attention in 1878; indeed, some observers of that time considered it a new find! Simon Newcomb, writing in 1902, states that the Spot appeared about 1878 and faded gradually, and that after 1892 it was faint or absent. He makes no mention of earlier sightings. He states that "a larger White Spot underlying it, first noticed a century ago, is still plainly visible." I presume that this "white" spot is in fact what we are seeing, that is, the Spot with the color faded out of it.

There are other red and white spots that appear for a few months at a time, but only the Great Spot remains. Its motion in both longitude and latitude is erratic, making 3-year predictions impossible, and that's why you don't see an ephemeris for it in the astronomical almanacs. I continue tracking during Jupiter season, adjusting the Spot equation as needed to follow the changing motion of the Spot.

The predictions are corrected for the changing aspect, phase, and light-time. At the given times, the Spot will be facing directly toward Earth, and thus will appear central on the apparent disk of the planet. Observations may be made for about an hour before and after that time. The times are given in local time, and include transits for which the planet is at least 1.2 hours up, with the Sun at least 30 down. A random amount from 0 to 10 minutes has been subtracted, to prevent anticipation when timing a transit. It is useful to know that the Spot moves its own length in about 30-40 minutes.

To see Jupiter's Great Red Spot, good seeing and a power of about 200-300 are needed. Begin half an hour before the given time. Use an apodizing screen if you have one; you might also experiment with colored filters, perhaps yellow, blue or green. A neutral-density filter has also been suggested by Steve Edberg of JPL; the first mention of a "seeing" filter was by Dr. Clyde Tombaugh, Sky and Telescope, August, 1949. He suggested an amber filter to cut glare and improve seeing a point or two when observing the full moon. ocus carefully, then look eastward along the south edge of the southern equatorial belt, seeking a dent where the belt narrows to perhaps 2/3 of its width. You will probably see the Spot, albeit with little or no color. Watch continuously for those moments when the air is especially stable, and the Spot will show itself in all its glory. Let me know of your results, especially if you are using an instrument smaller than 8 inches, or if you do some experimentation with observing aids.

Great Red Spot on Meridian PST

| da | mo | d | h | m | | da | mo | d | h | m | | da | mo | d | h | m | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sa | 10 | 1 | 3 | 24 | am | Su | 10 | 16 | 0 | 41 | am | Su | 10 | 30 | 2 | 17 | am |
| Sa | 10 | 1 | 11 | 15 | pm | M | 10 | 17 | 6 | 33 | am | Su | 10 | 30 | 10 | 2 | pm |
| M | 10 | 3 | 5 | 0 | am | Tu | 10 | 18 | 2 | 25 | am | Tu | 11 | 1 | 3 | 53 | am |
| Tu | 10 | 4 | 0 | 48 | am | Tu | 10 | 18 | 10 | 12 | pm | Tu | 11 | 1 | 11 | 45 | pm |
| W | 10 | 5 | 6 | 41 | am | Th | 10 | 20 | 3 | 59 | am | Th | 11 | 3 | 5 | 27 | am |
| Th | 10 | 6 | 2 | 28 | am | Th | 10 | 20 | 11 | 49 | pm | F | 11 | 4 | 1 | 24 | am |
| Th | 10 | 6 | 10 | 19 | pm | Sa | 10 | 22 | 5 | 36 | am | F | 11 | 4 | 9 | 16 | pm |
| Sa | 10 | 8 | 4 | 4 | am | Su | 10 | 23 | 1 | 31 | am | Sa | 11 | 5 | 7 | 8 | am |
| Sa | 10 | 8 | 11 | 56 | pm | Su | 10 | 23 | 9 | 17 | pm | Su | 11 | 6 | 3 | 2 | am |
| M | 10 | 10 | 5 | 45 | am | Tu | 10 | 25 | 3 | 10 | am | Su | 11 | 6 | 10 | 53 | pm |
| Tu | 10 | 11 | 1 | 33 | am | Tu | 10 | 25 | 10 | 59 | pm | Tu | 11 | 8 | 4 | 39 | am |
| Th | 10 | 13 | 3 | 12 | am | Th | 10 | 27 | 4 | 49 | am | W | 11 | 9 | 0 | 32 | am |
| Th | 10 | 13 | 11 | 5 | pm | F | 10 | 28 | 0 | 40 | am | W | 11 | 9 | 8 | 20 | pm |
| Sa | 10 | 15 | 4 | 53 | am | Sa | 10 | 29 | 6 | 27 | am | Th | 11 | 10 | 6 | 19 | am |

Clear Skies! Jim Van Nuland,
3509 Calico Avenue, San Jose, Cal. 95124

## SPACE PROGRAM UPDATE
## BY: BOB FINGERHUT

### IS THE SHUTTLE OVERHEAD?

NASA was to set a launch date today (14 Sept.) at the conclusion of a two day flight readiness review, but held off because of hurricane Gilbert. A date between 26 Sept. and 3 Oct. was expected. The last technical problems were cleared when a leaky fuel line was sealed and the last solid fuel booster test showed the excellent fault tolerance of the new design.

### SPACE STATION PACT READY TO SIGN

The 30 year intergovernmental agreement will be signed on Sept. 29 by the US, Japan, Canada, and nine European countries. The interagency memorandum of understanding will be signed at the same meeting by NASA and the partner agencies. Also, in a change of policy, Michael Dukakis has Joined George Bush in supporting a permanently manned space station.

### SOVIET SPACE PROGRAM

One of two Soviet spacecraft on the way to Mars may have been lost when a ground control error caused it to lose its antenna lock on Earth. The vehicle is believed to be tumbling. The spacecraft that is still under Soviet control contains a Phobos fixed site lander and a mobile "hopper".

A Soyuz-TM spacecraft, carrying two cosmonauts, landed safely Sept. 7th, one day late. The Soviet and Afgan cosmonauts were returning from six days on board the Mir space station. The retrorockets shut down early on the first attempt to re-enter due to a sensor that lost lock on the Earth's horizon and then because the landing would have been in China. On the second attempt a computer error caused an early shut down. A successful landing was made on the third attempt.

### CONTRACTOR FOR AXAF SELECTED

NASA has selected TRW to develop the Advanced X-ray Astrophysics Facility (AXAF). AXAF, the fourth of the great observatory series is intended for launch in mid-1996.

### SPACEHAB SIGNS AGREEMENT WITH NASA

Under the agreement, Spacehab will receive six partial space shuttle flights starting in 1991. Spacehab is a module that fits in the shuttle payload bay behind the cabin. It provides increased space for storage and experiments that is pressurized and accessible by the astronauts.

## DOUBLE, TRIPPLE AND MULTIPLE STARS
## BY: PATRICK DONNELLY

In the early autumn the constellation Lyra is high overhead in the evening and well placed for observation. Within the borders of the constellation there are several excellent groups of both double and multiple stars for viewing in almost any telescope.

Begin your tour with Epsilon Lyrae, the famous double-double star. With any optical aid this multiple star is separated into its two primary components 203" apart. Some people can see both stars with the naked eye. In a 4-inch or larger scope under high power each component becomes a close double. The separations for the close components are 2.7" and 2.2", so high power and good seeing are required for resolution. The double-double is an actual system with all four stars having a common proper motion. There are also several other background stars between the pairs to observe.

Just below Epsilon Lyrae is another multiple star, Zeta Lyrae. This group of stars has four (4) components with magnitudes of 4.5, 5.5, 11.5, and 13. The separation of the other three components for the 4.5 magnitude primary is greater than 30", and as such, separation is no problem. However, dark skies and an 8-inch telescope is probably required to see all the components. At least two of the components are part of the same multiple star system. While at Zeta swing the telescope next door to Delta Lyrae. The star is a vary wide double at 630", and the companions are yellow and blue to provide a pleasing contrast. There are also several other stars in the field, which show the same common proper motion as the two bright components. Delta and its companions may represent a small open cluster and a true multiple star systems. Finally, examine Vega. It has 3 optical companions all about 1' of separation away and magnitude 10.

The next region is that around Beta Lyrae. The primary star of Beta Lyrae is a 3.4 magnitude star. It is also the prototype its class of eclipsing variable stars. The star decreases over one whole magnitude every twelve days. However, this is only the beginning. Beta is a visual multiple star with four (4) companions around it all with separations greater than 45". The companions' magnitudes are 6.7, 9.2, 9.8, and 12.8. Thus, like Zeta, dark skies and at least an 8" telescope are necessary to view all the companions. It has been determined that the 6.7 and 9.2 companions are part of the Beta system. The other two companions are probably optical components, but no contradictory evidence exists. Just below Beta is another triple system, 8-Lyrae. This tripple is composed of components of 6, 1.5, and 11.5 magnitude.

The separations are greater than 30", and as such, if you can see them, you can resolve them. After all of this, move your telescope a little and view the ring nebula, M-57, next to Beta.

An entire evening's star viewing can be found within this one constellation with almost any size telescope.

## COMET COMMENTS
## BY: DON MACHHOLZ

Two faint comets have been recovered while Periodic Comet Temple 2 dims in our evening sky. The existence of Comet Machholz (1988j) is uncertain at this writing, as it passes 15 million miles from the sun on Sept. 17. Since it had not brightened as quickly as expected during pre-perihelion times, it is possible that the comet is so small that it will dissipate. If it does survive we'll see it in the evening sky beginning in early October.

Periodic Comet Churyumov-Gerasimenko (1988i): Jim Gibson of Palomar recovered this comet on July 6 at nuclear magnitude 18. It will be closest the sun next June and may reach mag. 13 at that time.

Periodic Comet Kopff (1988k): E. Alvarez, M. Belton and K. Meech recovered this comet from Mauna Kea, Hawaii last February. The comet showed no coma and was at mag. 21. It is still nearly two years away from perihelion, when it should be visible in smaller telescopes.

### EPHEMERIDES

| DATE | R.A. (1950) | DEC | ELONG | MAG | NOTES |
|---|---|---|---|---|---|
| | | Periodic Comet Tempel 2 (1987g) | | | |
| 09-26 | 18h 01.6m | -28°45' | 88° | 9.2 | This comet is still |
| 10-01 | 18h 19.7m | -29°36' | 87° | 9.3 | in our southern even |
| 10-06 | 18h 38.3m | -30°14' | 86° | 9.4 | -ing sky, pulling |
| 10-11 | 18h 57.2m | -30°40' | 85° | 9.5 | away from both the |
| 10-16 | 19h 16.3m | -30°52' | 84° | 9.7 | sun and earth. It |
| 10-21 | 19h 35.5m | -30°52' | 83° | 9.8 | travels through the |
| 10-26 | 19h 54.5m | -30°40' | 83° | 9.9 | Milky Way, making |
| 10-31 | 20h 13.3m | -30°17' | 82° | 10.0 | observation diffi- |
| 11-05 | 20h 31.8m | -29°42' | 81° | 10.1 | cult. By month's |
| 11-10 | 20h 49.8m | -28°58' | 80° | 10.2 | end it sets at 10 PM. |
| | | Comet Machholz (1988j) | | | |
| 09-26 | 13h 14.7m | +04°31' | 17° | 6.0 | The comet could be |
| 10-01 | 14h 05.2m | +04°20' | 26° | 7.1 | brighter by 3 mags., |
| 10-06 | 14h 49.8m | +03°40' | 32° | 8.0 | or it may not even be |
| 10-11 | 15h 29.2m | +02°49' | 38° | 8.7 | visible at all. We |
| 10-16 | 16h 03.5m | +01°54' | 42° | 9.3 | are certain about the |
| 10-21 | 16h 33.5m | +01°03' | 44° | 9.8 | positions, however. |
| 10-26 | 16h 59.6m | +00°17' | 46° | 10.3 | If it survives, it |
| 10-31 | 17h 22.5m | -00°22' | 47° | 10.7 | will be well-placed |
| 11-05 | 17h 42.7m | -00°55' | 48° | 11.1 | only through the end |
| 11-10 | 18h 00.8m | -01°21' | 47° | 11.5 | of November. |

## SEEKING COMETS

Nearly every month I report on returning comets being recovered. How is this done, and who recovers these comets? Let's take this space to discuss recoveries.

The orbits of periodic comets are fairly well-determined. As these comets

recede from the inner solar system, they dim and get beyond the reach of our telescopes. We know where they are, we just can't see them.

After the comet reaches aphelion (its farthest point from the sun) and begins another return visit, it brightens to where it can again be seen from the earth. In most cases professional astronomers, armed with large telescopes, and photographic film or CCD's, center on the expected location of the comet. Being able to record objects as faint as magnitude 23, they pick up (recover) the comet. If it is beyond the reach of the instrument, they wait another month and try again in its new expected location.

Often the telescope is tracked at the same direction and rate as the comet so that the comet image is "burned-in" to the film, while the stars will trail. Two exposures, indicating the correct direction and rate of motion of the comet, are needed before a comet is officially recovered. The comet is then assigned a temporary designation (ie: 1988k) and retains its proper name (ie: Comet Kopff). The name of the recoverer is reported, but not added to the comet.

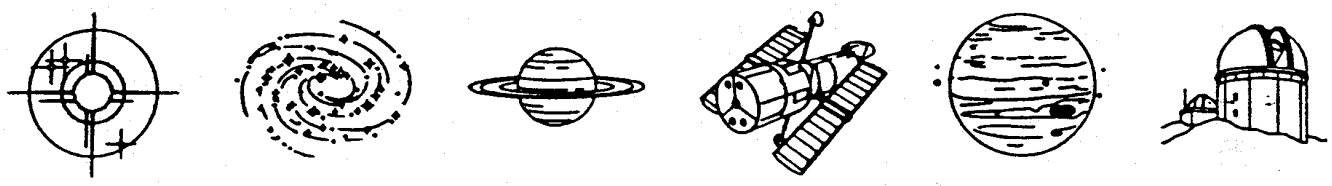
Presently about eight comets are recovered each year, but 1987 was a banner year with 17 recoveries. Other years see only four or five recoveries. As more periodic comets are discovered, there will be more returning comets to be recovered.

Occasionally an amateur recovers a comet visually. Charles Morris independently recovered Periodic Comet Faye in June, 1984 with a 10-inch telescope. The comet was mag. 12.5. The following year three Australians (Clark, Pearce, and Athanasou) visually recovered a tenth-magnitude comet which remained in the vicinity of the sun and thus avoided photographic detection.

Some of the professional astronomers presently recovering comets include Jim Gibson of Palomar (60" scope) and Jim Scotti of Kitt Peak (36" scope). The the Southern Hemisphere Alan Gimore and his wife Pam Kilmartin of Mt. John Observatory, New Zealand recover comets.

Several comets are under constant observation through-out their orbit. They are never recovered, in the true sense, and receive no temporary designation. They include Periodic comets Encke, Gunn, Schwassmann-Wachmann 1 , and Smirnova-Chernykh. As our telescopes see further into space this list will grow.


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 directly to the editor, John Gleason, 5361 Port Sailwood Dr. Newark, CA. 94560.



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