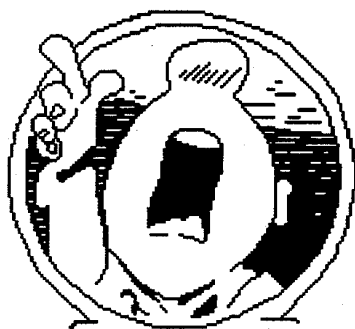


SJAA EPHEMERIS

VOLUME 4 NUMBER 4 OFFICIAL PUBLICATION OF THE SAN JOSE ASTRONOMICAL ASSOCIATION APRIL, 1993



The Eye Piece
by Bob Madden

We have a new author this month, Jeff Horn. His article about past issues of **SKY and TELESCOPE** is a much welcomed one. Someone should remind us of what is contained in those valuable issues. My approach is to photocopy the material I am interested in: ATM's Gleanings, Computing and Observing. However, I always want material I haven't got and I call Jim Van Nuland. I may tap Jeff also as a source. Many thanks Jeff for your article.

Bill Dellenges will begin a series for us beginning next month called "Stargazers Notebook" where he will discuss equipment, favorite clusters, use of binoculars, optical filters for planets, reflector vs. refractor, viewing locations in the Bay area, his trips, choosing a telescope, books on astronomy, and most important keeping a diary [which I don't do rigorously]. Bill may miss a month now and then, but will be a very nice addition to our newsletter.

There are others also who have contributed - Chung-Lin Lee and Rich Neuschaefer. I wish to thank them all.

Paul Barton, who does a wonderful job with our telescope loaner system, has stated that he has done well with finder scopes, but now needs eye-pieces in .965 and 1.25 sizes - mostly in

April 3: General Meeting 8:00 pm. Board of Directors Meeting 6:15 pm. Rick McWilliams, of Tangent Ind., speaking on Digital Setting Circles and other items.

April 4: Day light savings starts.

April 10: Night off - too much Moon.

April 17: Fourth session of Astronomy Class, 8 pm at the Milpitas Library.

April 24: Astronomy Day. See Jim Van Nuland for Houge Park set-up or Jack Petersen/Paul Mancuso for Milpitas Library set-up. Phone #'s on credit Marque.

April 30: Public star party at Houge Park. Sset 6:25 pm; 13% moon sets at 10:01 pm.

May 1: **SJAA Auction and Swap.** Held at Houge Park - Swap 1:00 pm to 5:00 pm. Auction 6:00 until we're done (10:00 pm ?).

There is no general Meeting this month

May 8: Night off - too much Moon.

May 15: Star Party at Henry Coe Park. Sset 8:08, 26% moon up 3:01am. Also Public Star Party at Grant Ranch County Park.

May 22: Star Party at Fremont Peak. Sset 8:12 pm, 3% moon sets 8:36 pm.

May 28: Public star party at Houge Park. Sset 8:20 pm, 55% moon sets 1:41 am.

May 29: Fifth session of Astronomy Class, 8 pm at the Milpitas Library.

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

the long focal length (25 to 40mm). Here is your chance to donate one for a good cause as Paul uses his own in the loaner program. We are looking for donations and maybe your old Kellner or Huygen that you don't use any more can be used now.

The Friends of Grant Ranch and Halls Valley Astronomical Group continue to hold star parties at Grant Ranch County Park on the third saturday of each month. Please mark your calendar if you intend to go. These parties are optional as many times a party at H. Coe or Fremont Peak state parks are scheduled on the same date. It will be your choice.

The slate of officers was determined by the Board Of Directors. The officers are selected from the newly elected and on-going board members. The result of these selections are that your officers remain the same for another year. They are:

President: Jack Zeiders

Vice President: Paul Mancuso

Treasurer: Jack Petersen

Secretary: Jim Van Nuland

The telephone numbers where each may be contacted is on the marque on page 7.

Sky and Telescope Back Issues by Jeff Home

Are your back issues of **Sky and Telescope** worth saving? Most readers of the magazine would say yes, and in my opinion they would be right. But just what makes **S&T** worth saving? Keeping the magazines so one can get a historical perspective on the development

Continued on page 2

SKY and TEL

Continued from page 1

of a theoretical piece of astrophysics is rather arcane, so I suspect saving the articles directly relating to telescope making or observing will be the most useful. I have Sky and Tel going back to January 1967, so it's quite a collection.

At the January meeting, I noticed we had a few members who were either new to the club or new to amateur astronomy as a whole. I wonder if they had any idea what went on in Sky and Telescope prior to 1992. So the following is a small list of the topics in previous years that I have found interesting. Copies of the articles can be obtained from your local library or by borrowing an issue from a SJAA member.

1) December 1989 and January 1990: S&T test report comparing Meade and Celestron Schmidt-Cassegrain telescopes.

2) April 1989, Gleanings for ATM's: Two arms are Better Than One. Two arm barn door drives for astrophotography. Phenomenal tracking accuracy is possible with simple parts.

3) March 1989, Observer's Page: How faint Can You See? By using a photograph of M67 with stellar magnitudes plotted, observers can determine the limiting magnitude for their telescope and observing site.

4) October 1988, Observer's Page: Making your own star atlas with Kodak T-Max P3200 film. By using a 35mm camera and zoom lens you can capture fainter than Sky Atlas 2000.0 in 30 second exposures.

5) July 1986, Gleanings for ATM's: A Stepping Motor for your Telescope. How to build a simple stepper motor drive circuit board for a camera or telescope.

6) April 1984, Vision and the Amateur Astronomer. An article on how our eyes work, dark adaptation, contacts, and eye glasses. How each of these affect observing and what can be done to improve your vision.

7) May 1982, Gleanings for ATM's: Surface Profiles from the Foucault Test. What does the data gained from the Foucault test of a mirror really tell you?

8) June 1981 Gleanings for ATM's: Balancing a Telescope with a spring. One amateur describes balancing his telescope with several springs rather than the usual counterweight.

9) July 1980, Gleanings for ATM's: Optical Configurations for Astronomical Photography. A classic article by Mike Simmons discussing different telescopes and how they perform both on and off axis. Computer generated spot diagrams are shown for Newtonian, Ritchey-Chretien, Schmidt-Cassegrain, and Simak.

10) January 1977, and February, March 1980, Gleanings for ATM's: Poncet Mount. How to build a simple equatorial table for your telescope.

11) February 1976, Observer's Page: Polar Alignment of Portable Equatorial Telescopes. Three methods of getting your telescope aligned to the pole.

DOUBLE, TRIPLE, AND MULTIPLE STARS

by Patrick Donnelly

You will be reading this article sometime in March or April. That means that you will be observing in the spring of the year, and you will probably be observing galaxies. Yes, you will be observing galaxies. It's difficult at this time of the year to not want to do that. After all the Virgo and Leo clusters are strung out across the skies to the south and the Ursa Major cluster is in the north. If you look carefully maybe you can convince yourself that NGC-3506 is the galaxy in which Star Wars took place.

So why would you want to observe double stars, if you could see so many wonderful galaxies? I can think of several reasons. First, there may be a moon that washes out the light of the dim galaxies. There may be some high cirrus clouds to hide the galaxies as effectively as the moon light. Finally, (my problems) the galaxy's light is ru-

ined by light pollution or the galaxies are behind the trees. When any of these misfortunes take place, I can still observe the double and multiple stars.

One constellation I like to observe this time of the year is Cancer, "the Crab". Cancer is high in the west in the evening this time of the year and well placed for observation. Begin your tour with I-Cancrī (+1268). Iota is a beautiful double consisting of a yellow primary and a brilliant blue secondary. I call this star the twin of Alberio, because of its similar brilliant colors and similar separation. It is a true double system about 1204 light years away. No change in position angle has been measured, but both components have the same proper motion and distance from the earth. It is, therefore, likely that they are members of a gravitationally bound system. Their magnitudes are 4.5 for the primary and 6.5 for the secondary, which makes this an easy pair in my telescope. Their separation is about 30" (arcseconds), which is almost identical to that of Alberio.

For the next double move down to A-Cancrī. Alpha is also a true double system. But like Iota this is deduced from the fact that the components have the same proper motion and are the same distance from the earth. Alpha is about 80 light years away. Alpha's components are magnitudes 4.5 and 11. The stars are separated by only 11.3" and visibility is difficult. Use a high power eyepiece to see this double. Both stars appear white to me.

After observing Alpha Cancrī, move over to M44, Praesepe. M44 is an open cluster referred to as the "Beehive Cluster". Located within the boundaries of this open cluster is a neat triple star system. It is +1254. +1254 consists of four (4) components of Magnitudes 6.5(A), 9.0(B), 8.0(C), and 9.0(D). The separations are AB-20.5", AC-63.2", and AD-82.6". It is rather interesting to try to find this triple in M44. As a hint, look at the southern edge of the cluster.

The final and definitely the most challenging system is Z-Cancrī. Zeta is a triple system with three (3) components of almost equal 5.8 magnitude stars. The problem with Zeta is that the

Continued on page 3

Continued from page 2

AB components have a separation of only 0.9". The seeing in the sky has to be extremely steady to resolve these two stars. The AC pair separation is about 6", which is quite easy for almost any telescope. Zeta is a true multiple system. The AB pair has a period of approximately 60 years, and the AC pair has a period of around 1150 years. The "C" component is actually two stars with a period of about 17-1/2 years. The separation is only about 0.18", which is beyond almost all telescopes. Zeta is about 70 light years away, and the "B" component is a star very much like the sun but a bit cooler and less massive.

There are many more double and multiple stars within reach of small telescopes in Cancer. Find a double star atlas of the constellation and explore it for yourself.

THE TEN BRIGHTEST GLOBULAR CLUSTERS

by Patrick M. Donnelly

Here's a question for you: Besides Omega Centuri, what is the brightest (i.e. has the brightest apparent magnitude) globular cluster visible from the San Jose area? I suspect that some of the answers would be M13, M5, M15, M4 or maybe M37. Actually, it's M22 in Sagittarius followed by M5, M13, and M4. Incidentally, M37 is an open cluster. Moreover, as another question: What is the brightest globular cluster north of the celestial equator, and what is its rank among the brightest globular clusters? The answer to this question is M5, and it is ranked as the sixth brightest.

I became interested in finding the answers to these questions, while I was visiting Mt. John's Observatory in New Zealand in July 1992. During my visit I was shown the five (5) brightest globular clusters in the entire sky. Imagine how surprised I was to learn that only two of them are visible from the continental United States. Actually, Omega Centauri is just barely visible for observers in the southern U.S. The other as stated above is M22. I then became interested in finding out more, so I decided to generate a list of the ten (10) brightest globular clusters. The list is

found at the end of this article.

The list was generated using the visual magnitudes listed in the "Sky Atlas 2000 - Volume 2". If you examine the table some interesting things can be seen. First, Omega Centauri is truly a giant among globular clusters. It is both the brightest and largest globular cluster on the list with a linear diameter of about twice the average size of a globular cluster. Also, surprisingly, M4 is apparently the closest globular to the earth. It and NGC-6397, a globular about 10 degrees south of M4, are the closest cluster to our planet. These two globulars made the list only because of their nearness. Finally, M3 would be very bright among the clusters, if it weren't so far away. No doubt it would rival 47-Tucani if it was at the same distance.

As a final note, it should be noted that over 75% of the globular clusters in our galaxy are located south of the celestial equator. This is readily explained by considering the fact that the earth's Northern Celestial Pole points away from the center of the Milky Way. Most globular clusters are located in the general direction of the galactic center, and that direction is to the south. Hence, most globular clusters are located in the southern heavens.

THE BRIGHTEST GLOBULAR CLUSTERS

| NAME | VISUAL MAGNITUDE | ABSOLUTE MAGNITUDE | DISTANCE (KPC) | DISTANCE (LY) |
|-------------------|---------------------|-----------------------|-------------------|------------------|
| 1. Omega Centauri | 3.65 | -10.27 | 5.2 | 17,000 |
| 2. 47-Tucani | 4.03 | -9.43 | 4.6 | 15,000 |
| 3. M22 | 5.10 | -8.45 | 3.1 | 10,000 |
| 4. NGC-6752 | 5.40 | -7.8 | 4.2 | 13,700 |
| 5. NGC-6397 | 5.65 | -6.65 | 2.2 | 7,200 |
| 6. M5 | 5.75 | -8.76 | 7.6 | 25,000 |
| 7. M13 | 5.86 | -8.49 | 7.2 | 23,500 |
| 8. M4 | 5.93 | -6.80 | 2.1 | 6,900 |
| 9. NGC-2808 | 6.30 | -8.53 | 9.2 | 30,000 |
| 10. M3 | 6.35 | -8.65 | 9.9 | 32,200 |

| NAME | CONSTELLATION | DEC | APPARENT DIAMETER |
|-------------------|----------------|---------|----------------------|
| 1. Omega Centauri | Centaurus | -47°29' | 36.3' |
| 2. 47-Tucani | Tucana | -72°05' | 30.0' |
| 3. M22 | Sagittarius | -23°54' | 24.0' |
| 4. NGC-6752 | Pavo | -59°59' | 24.0' |
| 5. NGC-6397 | Ara | -53°40' | 25.7' |
| 6. M5 | Serpens | +02°05' | 17.4' |
| 7. M13 | Hercules | +36°28' | 16.6' |
| 8. M4 | Scorpius | -26°32' | 26.3' |
| 9. NGC-2808 | Carina | -64°52' | 13.8' |
| 10. M3 | Canes Venetici | +28°23' | 16.2' |

Note: The Diameters are in arcminutes.

| NAME | DIAMETERS (LIGHT YEARS) | VISUAL MAGNITUDE |
|-------------------|----------------------------|---------------------|
| 1. Omega Centauri | 180 | 4.0 |
| 2. 47-Tucani | 135 | 4.5 |
| 3. M22 | 71 | 6.0 |
| 4. NGC-6752 | 96 | 7.0 |
| 5. NGC-6397 | 54 | 7.0 |
| 6. M5 | 127 | 6.2 |
| 7. M13 | 114 | 5.7 |
| 8. M4 | 53 | 7.4 |
| 9. NGC-2808 | 121 | 6.0 |
| 10. M3 | 152 | 6.0 |

Note: The visual magnitudes on this page are from the "Burnham's Celestial Handbook".

SETI and Microwave Comments

[This is a letter to the editor worth publishing here Ed]

Dear Bob:

The SETI (Search for Extra Terrestrial Intelligence) speech from Dr. Seth Shostak on March 5th 1993 was very interesting and educational. Through his beautiful slides and humorous talk you could get a general picture of what is going on right now.

Dr. Shostak answered some questions after the speech. He mentioned that laser optical wave will attenuate while it travels through the space. However the radio wave on the contrary will not attenuate. Well, I don't quite agree with him on this point of view.

Radio wave or microwave do attenuate while they travel either through a medium (coaxial cable or waveguide for example) or through space. The attenuation of microwave signals (in dB) in space depends on the distance between the power source and the receiver. The farther the source is, the bigger distance it will travel, hence the larger attenuation (loss) will be until it reaches the receiver. Besides the natural weather conditions (like rain, fog or snow) will also absorb the wave to some extent too. Let's imagine that a group of stars (say 100 light years away) transmit a signal toward earth. After such a long distance the power level may be only thousandths of a micro watt or even less when it reaches us. In order to be able to process or analyze the incoming signals we could either improve the noise/signal ratio (Noise Figure) of the receiver itself or increase the area of the antenna. We wouldn't have to build the huge antennas in order to catch the faintest signals from deep sky if the signals won't attenuate at all then.

Again I would like to express my great appreciation to Dr. Seth Shostak for his very informative and wonderful speech.

Chung - Lin LEE
Microwave Engineer

GETTING IT ALL TOGETHER

by Rich Newschaefer

It seems to be a constant learning experience trying to have all the tools needed for an observing session at hand when you're sitting there in the dark. It helps to keep the things together in a box, bag, etc. I keep finders, diagonals and other items in one box; eyepieces in another box; flashlights, some mount parts, tools, a cap, an gloves in a tough nylon bag; then charts and books in a big briefcase.

Some things can stay in the truck between observing trips. I don't like to keep optics or batteries in my truck due to the vibration and large changes in temperature. Theft is also something to think about. Keep your stuff covered and out of sight when it is in your vehicle.

Slow down when re-packing after an observing session and resist the urge to just toss your stuff in the truck. It really helps to put things back in the same place. I find if I keep changing boxes for different things, even if it makes sense at the time, it usually takes me longer to find the stuff when it's really needed. A check list is a big help if it has been several months since you've gone on an observing trip. *Continued on pg 5*

ASTRO AD

Continued from page 6

INTES MK 63, 6 inch f/10 Maksutov, complete telescope with tube, finder 6X30, photoguide scope 60mm f/25 Maksutov, fork mount, drive, drive corrector, slow motions, 2.4 X INTES barlow, 30mm INTES Kellner, camera adaptor, tripod adjustable, case. Exquisite optical performance; must sell for lack of space in my observatory. Will scrifice for \$1500 or make offer. Instrument is in immaculate condition! Write to Mr. Edward Hillyer 4900 N. Hwy 99 #238, Stockton, CA 95121 or call (209) 931-0486 after 7:00 pm. 4/93

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

COMET COMMENTS

by Don Machholtz

No new comets have been found lately, but Periodic Comet Schaumasse is performing well in our northern evening sky (see table I page 7). This month I am re-introducing my "Seeking Comets" feature. We will, as space and time permits discuss visual comet discoveries since 1975.

SEEKING COMETS

At what altitude in the observer's sky are comets discovered? We often imagine that comet hunters live where the horizons are low. Many do. But this is not necessary for discovering comets, as we see by looking at visual discoveries from 1975 through 1992.

In figure 2 on page 7, I plot the altitude of the comet at discovery along the left, and the number of comets found at that altitude interval along the bottom. The morning sky covers 46 discoveries of 36 comets, the evening sky represents 38 discoveries of 27 comets. The average for morning sky is 23.2 (+/- 10) degrees, with the median being 21 degrees. The evening sky average is 26.7 (+/- 13) degrees, with the median being 24 degrees.



Above is Jack Petersen, our Observational Astronomy instructor explaining the fine points (which way is up?) to several Cub Scouts.

Rich NeuSchaefer's "Getting it All Together"

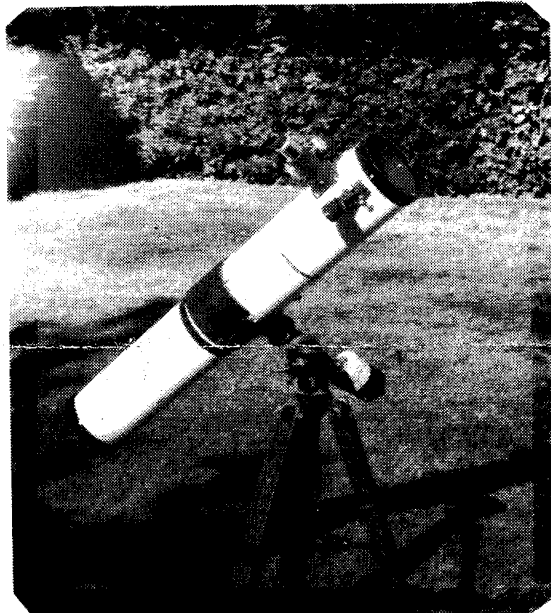
| Observing Tool List | Stuff I Use |
|--|--|
| Telescope Tools: | |
| Eyepieces & filters | Tele Vue, Brandon, Lumicon |
| Finders & diagonals | Telerad, Lumicon correct Viewing, Tele Vue |
| Battery | Orion 12v, 12 Amp-hr Porta pac |
| Alignment tools | Tectron |
| Vibration dampening pads | Kevin's (Epoch) |
| Cleaning stuff | The stuff from Orion |
| Photo equipment | When I become more masochistic |
| Tools: | |
| Allen Wrenches | OSH, ball end type,excellent |
| Screw drivers | Craftsman and others |
| Socket wrenches | Craftsman and others |
| Knife | a big one |
| Clothes: | |
| Cap and/or hat | Gander Mtn with Thinsulate |
| Ski bibs (winter) | REI Thinsulate |
| Jacket | REI Thinsulate and/or down |
| Thermal underwear | REI or Gander Mtn Polypropylene |
| Heavy wool blend socks | REI |
| Wool Shooting gloves | Gander Mtn with rubber dots |
| Self heating pads | REI lasts for one 6 hr period |
| Food and drink: | |
| Anything that isn't sticky or greasy | |
| Coffee, water, Diet Coke (it's not sticky) | |
| Other Stuff: | |
| Red Flashlights | Orion, Rigel Systems Starlight LED |
| Star charts and books | Uranometria, Astro Cards, Burnhams, etc. |
| Binoculars | Orion, Alderblick MC 10X50 |
| Chair | Directors type |
| Ladder | Wood |
| Table | Roll-a-table (Orion or REI) |
| Paper towels | thick ones |
| Sleeping bag | REI or Tri-City |
| Extra batteries | Dura-Cell or EverReady |
| Bug repellent | Bait shops, the 100% DEEt stuff |
| Compass | Tri-City or REI, Silva Hunter |
| Radio | Sony multi-band |

A sense of humor, you'll need it.

1993 SJAA Calendar

| General Meeting | | Houge Park Star Party | Observational Astronomy Class |
|-----------------|---------------------|-----------------------|-------------------------------|
| April | 3 | 30 | 17 |
| May | 1 Auction | 28 | 29 |
| 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 Whitlin | 5/10/93 |
| 6" | Dobson | Dave Simmons | 4/14/93 |
| 4" | Quantum | Ken Ward | 5/12/93 |
| 60mm | Cometron Ref. | J Schoenenberger | 4/29/93 |
| C-8 | Celestron | T Kahl (D Simmons) | 4/14/93 |
| 12-1/2" | Dobson | Mark Wagner (I Courtney) | 4/23/93 |
| 60mm | Tasco 44-T Ref. | [To be Auctioned] | Available |
| 6" | Newt/P mount | D. Petri | 5/17/93 |
| 8" | Dobson | L. Courtney | 4/28/93 |
| 8" | Newt/P Mount | Richard Raw | 4/27/93 |
| | | (on waiting list) | |

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.

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) 2632896. 3/93

Astro-Physics 6" Starfire, f/9, air spaced triplet APO refractor tube assembly. Only 21 lbs and 50" long (dew cap retracted). Beautifully made, great views, about 1 and 1/2 yrs old. All Astro-Physics parts: 2.7" focuser, 2" & 1.25 adapters, 2.5" extension, sliding dew shield, cover, case, plus mounting rings - \$2550. Call Rich Neuschaefer WK (408) 285-6818 Jim (408) 446-0975 3/93

Meade 2080 LX-5 W/MCOG, field tripod and wedge. Inc 9X69 RA polar illuminated finder, AC/DC adapter and cable, Quartz pulse drive, 2" star diagonal and 1.25 adap. Remote hand controller and Moto-dec, storage trunk, T-adapter for Yashika SLR, 1.25" 9mm, 26mm Meade eyepieces, 2" 18mm Or and 60mm Celestron Kellner eyepieces, small reference library - entire package only \$1300. Call or write Steve DeMelo, P.O. Box 311 Shingle Springs, CA 95682 - (916) 677-9575 3/93

2 Tasco telescopes, both excellent condition. T-58 model \$100 and T-48 model \$75. Call Rebeca Newell (408) 259-8027 3/93

Celestron 8 S/C, Super Polaris, manual drive, 6X30 finder, stool, but no case, star diag, 2X Barlow, Oculars of 7.5, 15, 26 and 36mm - Illuminated reticle w/ battery Pack. Ask \$1400/OBO. Call Carl Harris (408) 338-9580 3/93

Yeager 3-1/4" refractor on a super polaris Mount. Contact Phyllis Rose (408) 293-6611 3/93

Continued on page 4

CELESTIAL CALENDAR

April 1993

| Lunar Phases | Date | Rise | Tran | Set |
|--------------|------|------|------|------|
| FM 18:44hr | 06-4 | 1905 | NoTr | 0515 |
| LQ 19:39hr | 13-4 | 0104 | 1809 | 1113 |
| NM 20:16hr | 21-4 | 0451 | 1156 | 1900 |
| FQ 23:50hr | 29-4 | 1152 | 1825 | 0056 |

Nearer Planets

| | | | | |
|----------|------|------|------|------|
| Mercury | 07-4 | 0542 | 1031 | 1618 |
| 0.898 AU | 17-4 | 0439 | 1039 | 1640 |
| Mag -1.6 | 27-4 | 0438 | 1058 | 1719 |

| | | | | |
|----------|------|------|------|------|
| Venus | 07-4 | 0450 | 1124 | 1753 |
| 0.287 AU | 17-4 | 0410 | 1039 | 1640 |
| Mag -2.9 | 27-4 | 0341 | 0956 | 1612 |

| | | | | |
|----------|------|------|------|------|
| Mars | 07-4 | 1111 | 1835 | 0202 |
| 1.269 AU | 17-4 | 1054 | 1814 | 0137 |
| Mag +0.2 | 27-4 | 1038 | 1754 | 0112 |

| | | | | |
|----------|------|------|------|------|
| Jupiter | 07-4 | 1738 | 2336 | 0537 |
| 4.46 AU | 17-4 | 1654 | 2252 | 0454 |
| Mag -2.5 | 27-4 | 1608 | 2209 | 0412 |

| | | | | |
|-----------|------|------|------|------|
| Saturn | 07-4 | 0341 | 0903 | 1424 |
| 10.455 AU | 17-4 | 0304 | 0824 | 1349 |
| Mag +1.2 | 27-4 | 0228 | 0751 | 1313 |

| | | |
|---------------|------|----------------|
| SOL Star Type | G2V | Mag - 26.72 |
| | 07-4 | 0541 1208 1834 |
| | 17-4 | 0527 1205 1843 |
| | 27-4 | 0513 1203 1852 |

| Astronomical Twilight | rise | set |
|-----------------------|------|--------------|
| JD 2,449,084.5 | 07-4 | 0514 - 1900 |
| 9,094.5 | 17-4 | -0459 - 1910 |
| 104.5 | 27-4 | 0446 - 1920 |

Sidereal Time

| | | |
|----------------|------|---------------|
| Transit Right | 07-4 | 0000 PST=1257 |
| Ascension at | 17-4 | 0000 PST=1336 |
| Local Midnight | 27-4 | 0000 PST=1416 |

| | |
|--------------|------------------------|
| Darkest | Saturday Night Apr. 24 |
| Sunset | 1849 |
| Twilight End | 1917 |
| Moon Set | 2155 |

TIMES AND DATES ARE PACIFIC DAYLIGHT

by Richard Stanton

Derivation of these values are from
**Astronomy with Your Personal
Computer**

by Peter Duffet-Smith
Voyager

by Carina Software
MacEphem

by Elwood Charles Downey
Observer's Handbook 1993

RASC

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COMET COMMENTS

Continued from page 4

EPHEMERIS

PERIODIC COMET SCHAUMASSE (1992x)

| DATE(00UT) | R.A. (2000) | DEC. | ELONG | SKY | MAG |
|------------|-------------|---------|-------|-----|------|
| 03-24 | 07h08.2m | +47°17' | 98° | E | 8.6 |
| 03-29 | 07h38.3m | +46°35' | 99° | E | 8.8 |
| 04-03 | 08h07.7m | +45°23' | 100° | E | 9.0 |
| 04-08 | 08h35.7m | +43°42' | 101° | E | 9.3 |
| 04-13 | 09h01.8m | +41°39' | 101° | E | 9.6 |
| 04-18 | 09h25.9m | +39°17' | 102° | E | 10.0 |
| 04-23 | 09h47.9m | +36°35' | 103° | E | 10.4 |
| 04-28 | 10h07.9m | +34°03' | 103° | E | 10.8 |
| 05-03 | 10h26.1m | +31°18' | 103° | E | 11.2 |
| 05-08 | 10h42.8m | +28°34' | 103° | E | 11.6 |

FIGURE 1

MORNING SKY

| |
|-----------------------|
| 75 |
| 70 |
| 65 |
| D 60 |
| E 55 |
| G 50 |
| R 45 XX |
| E 40 XXXX |
| E 35 XXXX |
| S 30 X |
| 25 XXXXXXXXX |
| H 20 XXXXXXXXXXXXXXXX |
| I 15 XXXXXX |
| G 10 XXXX |
| H 05 X |
| 00+ + + + + |
| 0 4 8 12 16 |

NUMBER OF COMET DISCOVERIES

EVENING SKY

| |
|----------------|
| 75 X |
| 70 |
| 65 |
| D 60 |
| E 55 X |
| G 50 X |
| R 45 |
| E 40 XXX |
| E 35 XXX |
| S 30 XXXXX |
| 25 XXXXXXXXX |
| H 20 XXXXXXXXX |
| I 15 XXXXX |
| G 10 X |
| H 05 XX |
| 00+ + + + + |
| 0 4 8 12 16 |

NUMBER OF COMET DISCOVERIES

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FIGURE 2

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