San Francisco Amateur Astronomers

The Randall Museum
199 Museum Way, San Francisco 94114

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BULLETIN FOR FEBRUARY 1991

Date: WEDNESDAY, FEBRUARY 20

Time: 8:00 P.M.

Place: THE RANDALL MUSEUM

Speaker: DR. W.J. SHILOH UNRUH
LICK OBSERVATORY

Topic: PULKOVO OBSERVATORY
LENINGRAD, U.S.S.R.

Dr. Shiloh Unruh has been in love with the stars and with Lick Observatory since his childhood, when he grew up in the shadow of Mount Hamilton. He received his B.A. in history from California State University, followed by a Ph.D. in history of science from the University of California.

In 1985, anticipating Lick Observatory's Centennial, Dr. Unruh collaborated with Donald Osterbrock and John Gustafson to write the history of Lick Observatory, "Eye on the Sky", published by UC Press in 1988. The book has received excellent reviews.

Dr. Unruh has assembled a collection of over 6,000 photographs, which he draws upon for slide presentations and frequent speaking engagements. For many years he has presented the historical talks at Lick Observatory's Friday night visitors program. On weekends he can usually be found conducting tours of the observatory.

In May of 1990, Dr. Unruh was invited to visit world-famous Pulkovo Observatory near Leningrad, U.S.S.R. He will share the highlights of his memorable visit with us. Anyone with a general interest in astronomy, telescopes or curiosity about the Soviet people, should not miss this talk!

NEXT STAR PARTY FEBRUARY 16

The next SFAA star party at Rock Springs on Mount Tamalpais is on Saturday evening, February 16, beginning at dusk. If the weather is poor, the star party may be cancelled. Save yourself a possibly wasted trip by calling the star party hotline (468-3592) on Saturday afternoon before you leave home.

Weather permitting, February should be a great month for observing. It may be a bit chilly (be sure to dress warmly), but the winter sky will be glorious! The evening "star", Venus, will hang in the west at sunset, followed by bright but fading Mars near the Pleiades star cluster and mighty Jupiter in the east. The Great Red Spot will lie on Jupiter's central meridian - perfectly placed for observation - at nine o'clock on star party night. Don't miss it! (Read up on Jupiter before the star party on pages three and seven of this issue.)

Three of the Messier catalog's greatest hits are visible this month: the Andromeda Galaxy (M31), the Pleiades (M45) and the Great Nebula in Orion (M42/43). Try to observe M31 early in the evening (it's near the western horizon) and have a look at its two smaller companions (M32 and M110). Then swing your scope or binoculars east, pausing at the Pleiades in Taurus, one of the most beautiful open star clusters in the sky and an easy naked-eye object. On to Orion and you've already logged six Messier objects!

Now that you're off to such a good start, why not "earn your spurs" as an amateur astronomer by tackling the rest of the Messier list? For inspiration and guidance, have a look at the article, beginning on page four of this issue, by a fellow SFAA member who just did it. You'll find there's a tremendous sense of accomplishment in achieving such a goal. Call Bill Cherrington at 752-9420 and register with the AANC Messier Club before you get started.

TRACKING THE HST - reported by Jeff Felton

According to SFAA member Jeff Felton, the Hubble Space Telescope (HST) transited the sky, crossing from east to west near the southern horizon, between 6:29 and 6:45 on the evening of our January star party (the 19th). Did anyone see it?

Jeff was clouded out in San Francisco that evening, but was able to spot the HST the following night from Twin Peaks. He reports that it was very bright - perhaps 1st magnitude - and didn't look anything like an airplane.

Jeff is running orbital elements from NASA forward to determine future favorable apparitions of the space telescope overhead. If you'd like to be on the hotline to receive advance warning, call him at 564-7082.

Jupiter in February

by Fred Sammartino

February is another banner month for Jupiter. The planet is just past opposition and is nicely placed for observing all evening. As the earth moves from its position between Jupiter and the sun, we get a more oblique view of the planet and its moons. Because of that, the distance between a moon and its shadow will widen noticeably during the month, particularly for the outer moons. As Jupiter approaches "fall equinox" in its 12-year orbit, the moon plane continues to flatten out as seen from earth. The moons appear very close to each other and sometimes touch when they pass in orbit. Here are times (PST) for moon conjunctions visible locally.

Close Encounters of the Moon Kind

(Eu=Europa, Ga=Ganymede, Ca=Callisto)

Io-Eu: Sat, Feb 2, 2:06 AM
Io-Ga: Sun, Feb 3, 11:58 PM
Io-Ga: Thu, Feb 7, 12:50 AM
Eu-Ga: Thu, Feb 7, 10:53 PM
Io-Eu: Sat, Feb 9, 4:19 AM
Io-Ga: Mon, Feb 11, 2:30 AM
Eu-Ca: Wed, Feb 13, 8:07 PM
Ga-Ca: Wed, Feb 13, 10:07 PM
Io-Ga: Thu, Feb 14, 3:11 AM
Eu-Ga: Fri, Feb 15, 2:01 AM
Io-Eu: Tue, Feb 19, 7:34 PM
Io-Eu: Thu, Feb 21, 3:16 AM
Eu-Ga: Sun, Feb 24, 8:55 PM
Io-Eu: Tue, Feb 26, 9:44 PM
Eu-Ca: Fri, Mar 1, 1:38 AM
Io-Ca: Fri, Mar 1, 8:15 PM

Activity on Jupiter's cloudtops continues to change. The southern equatorial belt (the one with the red spot), which totally vanished last year, has returned to *partial* prominence. On my last observation in mid January, it was the lighter and wider of the two belts. The northern belt continues to show a lot of activity, with always a storm or two appearing as knots in the belt. The red spot is hazy brown and a bit challenging to see. Take a look at the red spot for yourself this month - it should be visible for about an hour and a half before and after the times given below (PST).

Spot the Spot! (red spot at central meridian)

Fri, Feb 1, 11:45 PM
Sat, Feb 2, 7:36 PM
Mon, Feb 4, 1:23 AM
Mon, Feb 4, 9:14 PM
Wed, Feb 6, 3:01 AM
Wed, Feb 6, 10:52 PM
Fri, Feb 8, 4:38 AM
Sat, Feb 9, 12:30 AM
Sat, Feb 9, 8:21 PM
Mon, Feb 11, 2:08 AM
Mon, Feb 11, 9:59 PM
Wed, Feb 13, 3:46 AM
Wed, Feb 13, 11:37 PM
Thu, Feb 14, 7:29 PM
Sat, Feb 16, 1:15 AM
Sat, Feb 16, 9:07 PM
Mon, Feb 18, 2:53 AM
Mon, Feb 18, 10:45 PM
Wed, Feb 20, 4:31 AM
Thu, Feb 21, 12:23 AM
Thu, Feb 21, 8:14 PM
Sat, Feb 23, 2:01 AM
Sat, Feb 23, 9:52 PM
Mon, Feb 25, 3:39 AM
Mon,Feb 25, 11:30PM
Tue, Feb 26, 7:22 PM
Thu, Feb 28, 1:09 AM
Thu, Feb 28, 9:00 PM
Sat, Mar 2, 2:47 AM
Sat, Mar 2, 10:38 PM

Here are some interesting moon configurations for February. The red spot and moons move right to left in front of Jupiter and left to right behind Jupiter in these pictures. Moons not shown are out of the field of view. All times are PST.

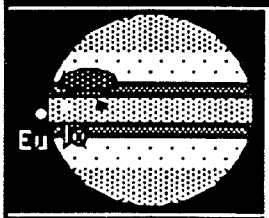
Wed, Feb 6, 10:30 PM
Io in transit with shadow under red spot, Europa will go behind Jupiter in 1/2 hour.

Wednesday evening, Feb 13 - Multiple moon conjunctions!

8:07 PM - Callisto passes above Europa

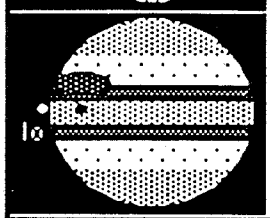
10:07 PM - Callisto passes above Ganymede, red spot visible near limb

11:37 PM - red spot at central meridian, Io in transit with its shadow visible



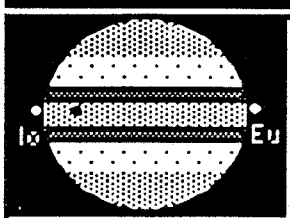
WATCH IO AND EUROPA CHANGE PLACES!

1:10 AM - Io, ready to exit transit, is hard to see. Europa, easily visible, is ready to enter occulation. Red spot and Io shadow visible.



1:25 AM - Now it is Europa which is invisible behind Jupiter. Io is clearly visible, having just emerged from transit. Io shadow visible just below the red spot, which is at the limb ready to round the corner around Jupiter.

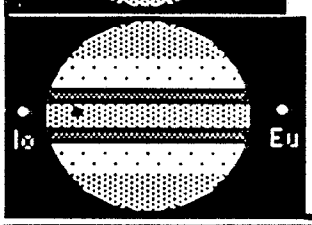
3:11 AM - Io passes above Ganymede, Europa still invisible.



SYMETRIC MOONS!

Friday, Feb 15, 7:50 PM

Io has just exited transit (shadow still visible), and Europa is just ready to enter transit at the other side of Jupiter.



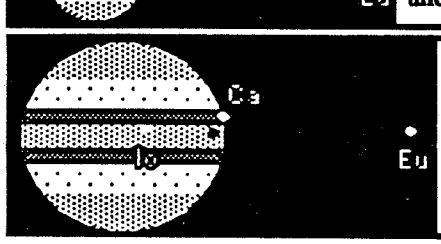
Friday, Feb 22, 9:48 PM

Nearly identical event, one week later!

MAGICALLY REAPPEARING MOON!
Sunday, Feb 24, 8:40 PM - Ganymede near Jupiter, Europa invisible in Jupiter's shadow.

8:55 PM - Europa slowly brightens into visibility, just in time to have a close conjunction with Ganymede.

2:30 AM - Ganymede just exited transit, shadow visible under red spot.



Fri, Mar 1, 9:55 PM - Io in transit. Callisto ready to start transit near Io's shadow. Earlier at 8:15 PM, Io passed Callisto in orbit.

ON SEEING THE MESSIER LIST - by Dennis Tye

After getting my Celestron C-8 a couple of years ago, I started out by looking for interesting deep sky objects that I had seen in magazines and photographs. Not surprisingly, most of these objects were from the Messier catalog. In the 1750's Charles Messier, a Parisian comet hunter, compiled a list of fuzzy objects that might be mistaken for comets. Amateur astronomers ever since have been using his list as a starting point for deep sky observing.

Shortly after I started observing, I saw a notice in the SFAA Bulletin about the Messier Club of the Astronomical Association of Northern California (AANC). It said that anyone who observed all 110 of the Messier objects could join the group and would receive an award commemorating his achievement. My first reaction was "NO WAY". I felt that it would be too difficult to spot the entire list.

I continued to search for Messier objects in a rather haphazard way and discovered that they are not all that difficult to find. After observing 25 or so I decided to make a more concerted effort. I located most of the globular clusters first, because they're easy to find, and then progressed to the brighter nebulae and open clusters. After finding 50-60 objects I felt that I had a real chance to complete the entire list. At that point I began searching in a more organized manner.

A couple of references were very useful in organizing my efforts. First I obtained a computerized Messier catalog from which I could sort the objects by right ascension and magnitude. Then I bought "The Messier Album" by John Mallas and Evered Kreimer, which contains photographs, sketches and descriptions of all the Messier objects. It was invaluable in confirming my observations.

All of my observations were made with my Celestron C-8. I used several different eyepieces, but found the 20mm and 40mm oculars the most useful. I did most of my searching with the setting circles on my telescope. I have heard some disparaging remarks about setting circles but, with careful polar alignment, I was able to get within 30 arc minutes or so of the object most of the time. I usually spend 15-30 minutes at the beginning of each observing session setting up my telescope and adjusting the polar alignment. I soon learned, from those occasions when I was a degree or two off, that frequently checking the alignment throughout the night will save much futile hunting time.

Of the various kinds of objects on the Messier list, I found that the globular clusters were the most interesting and easiest to find. (M5 is my favorite.) Next came the open clusters, generally easy with a few exceptions (like M48) which are not as distinct. The diffuse nebulae are not too difficult, as most are relatively bright. The planetary nebulae, however, are dimmer and a bit more of a challenge.

For me the galaxies were the most challenging and rewarding objects on the list. Most are fainter than eighth magnitude and thus not visible in my finderscope, so I had to depend on good setting circle work to find them. The hardest object for me was probably M74, a tenth magnitude spiral galaxy in Pisces. The listed magnitudes of galaxies can be deceiving because the objects are often spread out over a wide field. M33 in Triangulum, listed at 6.7 magnitude, is much harder to find than a star or cluster of the same magnitude.

Overall it did not take that long to find all the objects. Even though I spread my observations over 16 months (the Messier Club allows two years), I only spent about six weekends of actual observing time. At two to three hours each session, this averages out to about 15 minutes for each object. For me this was enough time to locate the object, study it with several different eyepieces and take notes. I could have completed the list a few months earlier, if I had not missed the last few objects and had to wait for them to appear in the night sky again.

The benefits I derived from my observations were learning to use my equipment, training my eye to spot deep sky objects and simply enjoying the view of each object as I found it. Now that I have completed the Messier list, I look forward to going back and re-observing these objects at leisure, and to relishing the sight of them many times again.

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For those of you interested in observing the Messier catalog on your own, I would offer the following advice:

* Get to know your equipment, be it an equatorial or Dobsonian mount. Learn how to polar align your scope, use your setting circles and align your finder or other pointing aid.

* Get acquainted with the sky. With a Dobsonian you will need to star-hop.

* Buy a good reference guide for the Messier objects, such as the Mallas/Kreimer book, and a good sky chart or atlas. These will be useful both as finding aids and to confirm sightings.

* Develop an observing plan for the entire list, by type of object, magnitude and sky location (right ascension). Make a list of the objects you plan to look for at each observing session.

* Keep a log of your observations. Not only will this make an interesting record, the Messier Club representative will want to see it to verify your observations.

To help you plan your observing program, the Bulletin will be carrying a monthly list of Messier objects, beginning this month. About ten objects per month will complete the list in around a year's time at a leisurely pace.

Whenever possible, I have tried to select easy-to-find objects during the early months, saving the more difficult objects until the observer has gained some experience. The monthly lists are generally arranged so that objects lowest in the western sky are shown first. Try to observe the objects when they are at their highest in the sky, near the meridian.

If you don't get out every month, you can batch up two or three months' lists for one observing session. However, don't tarry too long or the objects will sink too low in the western sky to be seen after sunset.

FEBRUARY LIST OF MESSIER OBJECTS

This month there are ten objects on our list: five open clusters, two diffuse nebulae and three galaxies. Look at the galaxies early in the evening, before they get too far down in the west. Pay particular attention to the appearance of M32 and M110. In a few months you will need to be able to spot many fainter galaxies.

NGC#	MES	RA	DEC	Mag	TYP	SIZE	DIST	CON	DESCRIP
0224	031	00 40.0	+41 00	04.8	Sb	160'x 35'	M2.36	AND	Andromeda

The Andromeda galaxy - easy to spot with the naked eye once you get to know its location. Use low power as it fills over 1 deg. field.

0221	032	00 40.0	+40 36	08.7	E2	3.4'x2.8'		AND	

A companion galaxy to M31. Should be visible in same field as M31. Get acquainted here with the appearance of fainter galaxies.

0205	110	00 37.6	+41 25	09.4	E6	010'x4.5'		AND	

Another companion of M31 a bit farther off. Try using your fine adjustments to locate off of M31/M32.

1039	034	02 38.8	+42 34	05.5	OCL	018'	0440	PER	

Large open cluster with lots of doubles.

0022	045	03 43.9	+23 58	01.4	OCL	100'	0126	TAU	Pleiades

Easily visible naked eye. Too wide for most telescope eyepieces. Good binocular object.

1976	042	05 32.9	-05 25	04	DIF	066'x060'	0300	ORI	Orion

The middle "star" in Orion's sword. Look at the stars in the Trapezium, a stellar nursery.

1982	043	05 33.1	-05 18	09.1	DIF	020'x015'		ORI	

Actually a part of M42 separated by a dark area.

1912	038	05 25.3	+35 48	07.4	OCL	020'	1100	AUR	

A moderately large open cluster, should be visible in finder.

1960	036	05 32.0	+34 07	06.3	OCL	012'	1160	AUR	

A rich, tight open cluster with many bright stars.

2099	037	05 49.0	+32 33	06.2	OCL	020'	1450	AUR	

Moderately large, bright open cluster with about 150 stars.

NOTE: Explanation of table headings

- NGC# - New General Catalog number, if any
- MES - Messier list number
- RA - Right Ascension
- DEC - Declination
- Mag - Visual magnitude
- TYP - Type: OCL, GCL, PLA, DIF, Sc, Sb, E1-4, etc.
- SIZE - Size of the object in arc sec's or minutes.
- DIST - Estimated distance to object
- CON - Constellation where the object resides
- DESCRIP - Description, common name

JUPITER: THE REIGNING MONARCH OF THE PLANETS

Joel W. Goodman

As Mars gradually fades amidst the Pleiades, mighty Jupiter outshines it to the east in Cancer, having just reached opposition on January 28. At that time, and for weeks thereafter, it glows brilliantly at magnitude 2.8, easily surpassing every other object in the evening sky (except, of course, the moon). There is a majesty about Jupiter that instantly captures the attention of even the most casual sky-scanner, and well it should for it is indeed the king of the planets. Though its orbit lies beyond the asteroid belt and it never approaches closer than about 350 million miles to Earth, it usually dominates the night sky when it is visible. The reason for this dominance is simple: Jupiter is more massive than all the other planets combined! It's equatorial diameter is more than eleven times that of our puny planet, and its mass equals 318 Earths! Aside from the sun, Jupiter is the biggest kid on the block (the block being the solar system).

A body the size of Jupiter has some fascinating properties. Though not quite massive enough to be a star, the interior of Jupiter is nonetheless quite hot, with the temperature at the core estimated to be in the neighborhood of 20,000-30,000 K. This means that the body of Jupiter must be liquid, because such heat would melt the elements of which it is composed. Speaking of elements, Jupiter, like the other "giant" planets (Saturn, Uranus and Neptune) is composed almost entirely of the lightest, hydrogen and helium, giving it a much lower density than Earth's. The combined effects of Jupiter's temperature and the immense internal pressure caused by its enormous mass dictates that these light elements be liquid throughout the planet, so Jupiter is, in a real sense, a sea of hydrogen, or, rather, a soup of which hydrogen is the major ingredient. This liquid planet is enshrouded by a thick and complex atmosphere, which is what we see when we turn our telescopes to Jupiter.

Just about any telescope worthy of the name will show Jupiter as a series of dark belts interspersed with light zones that encircle the planet parallel to the equator. Good telescopes as small as 3 inches aperture will reveal, in addition to the major banded structure, a wealth of more subtle detail, including wisps and festoons emanating from the dark belts, as well as light ovals and spots within the belts and zones. Of course, larger instruments will reveal correspondingly more delicate features, but the owner of even the smallest telescope will find Jupiter a very satisfying object to study. A 3-inch telescope will easily show the Great Red Spot in the South Temperate Zone of the planet when it is near maximum intensity, the longest-lived observed Jovian feature. It has been followed since the 18th century and probably existed before then, but went unnoticed by earlier observers using primitive instruments. This rust-hued oval has dimensions of 25,000 km by 10,000 km, which is roughly equal in area to the Earth's entire surface. The Red Spot, which is believed to be the top of a gigantic magnetic storm in the Jovian atmosphere, varies dramatically in visibility as it rises and falls in the dense atmosphere. It has been unusually faint during most of the past decade. This highlights another dramatic aspect of Jupiter: its appearance varies continuously, particularly the finer detail within the belts and zones. In addition to changes due to its rapid rotation (its period of rotation is less than 10 hours), which alter its aspect from hour to hour, longer term changes frequently occur. Variation in visibility of the Red Spot is one example, and the disappearance of the South Equatorial Belt about a year ago is another.

This usually conspicuous feature has now reappeared and is fully visible again. This unpredictable panorama constitutes a special treat for the observer, adding an element of excitement to the pleasures of observational astronomy.

Parenthetically, another example of abrupt planetary change was the sudden appearance last October of a brilliant white spot in the Equatorial Zone of Saturn. This strikingly bright feature was clearly visible in small telescopes and spread gradually into a narrow streak that girdled much of the planet. Unfortunately, Saturn is now too close to the sun to follow the further evolution of the storm, and it may well fade below the threshold of visibility by the time the planet can be observed again in the morning sky. Interestingly, white spot eruptions of this kind occur with a predictable periodicity of about 30 years in Saturn's equatorial zone.

Jupiter is accompanied by a retinue of satellites, many of which are very small bodies under 100 km in diameter which were discovered by the Voyager spacecrafts. However, the four largest moons were discovered by Galileo in 1610 with his crude 30 power spyglass and can be seen with steadily held binoculars when distantly positioned from Jupiter. Indeed, all of the Galilean satellites are brighter than magnitude 6 and would be visible in dark skies without optical aid were it not for the brilliance of Jupiter. It is entertaining to watch these satellites (which are Io, Europa, Ganymede and Callisto in order of distance from Jupiter) change their positions and undergo transits, occultations and eclipses as they orbit the parent planet. There is scarcely a more beautiful sight in the heavens than watching a satellite transit across the face of Jupiter, casting its ink-black shadow on the planet.

Next time, we will take a closer look at Io, the innermost Galilean satellite, which is the most volcanically active body we know of in the solar system.

BULLETIN CONTRIBUTIONS

The SFAA Bulletin is a forum in which club members may share their ideas and experiences in astronomy. We encourage you to participate and welcome your letters to the editor, announcements, sketches and articles on astronomical topics. The Bulletin also carries members' non-commercial advertising for astronomy books and equipment on a space available basis.

Please send your contributions to the SFAA Bulletin, C/O Jim Shields, 190 Chilton Avenue, San Francisco 94131. Deadline is the 18th of the month.

SFAA MEMBERSHIP BENEFITS

The club is now offering three categories of membership, with annual dues as follows:

REGULAR membership - $20
FAMILY membership - $25
JUNIOR membership - $ 5 (for astronomers under 18)

SFAA members receive the monthly Bulletin and free admission to club activities including monthly lecture meetings and star parties, field trips and the annual picnic. In addition, they may subscribe to SKY & TELESCOPE, ASTRONOMY, DEEP SKY and TELESCOPE MAKING (any or all) at greatly-reduced rates. For more information, contact Chelle Beard, 32 Penhurst Avenue, Daly City 94015. Telephone 878-4965 evenings.

Seeing Double in Orion

by *STEVE GOTTLIEB*

Because of the serious light pollution in the San Francisco Bay area, deep sky observing of galaxies is a difficult endeavor at best. Even some of the relatively bright Messier objects can pose severe observing challenges. For example, M74, a face-on spiral in Pisces used to give me fits from my backyard observing with a C-8. On the other hand, there is a deep sky activity which is not affected by our Bay Area bright sky–namely, double star observing.

In viewing double or multiple stars the critical factor is the steadiness of the seeing, not the transparency. On several occasions when a thin later of fog or a bright moon rendered observing extended objects impossible, I have found the local seeing to be under 1 arc second and excellent for attacking double stars. The next clear winter night make sure your scope is well collimated and head outdoors to tackle some of the double stars in Orion.

A quick check on the seeing conditions can be obtained by a peak at Rigel (Beta Orionis), the lower right star in the main outline of the hunter. This 0.2 magnitude star has a mag 6.7 companion 10" distant. Though difficult is scopes less than 6" aperture due to the large magnitude contrast, this pair should be easy to split in a 6" or 8" scope at 100X. If the faint partner is not readily visible, head back indoors and wait for a steadier evening.

Our first destination is Sigma, located just below the "belt" of Orion. This system consists of a 4.0 primary with fainter companions of mag 10.3, 7.5, 6.3 strung out at separations of 11", 13", and 42", respectively. Another bright system that is easy to locate is Iota, just 0.5° south of M-42, marking the bottom star of the "sword". This 3rd magnitude star is a visual triple with a 7th magnitude companion at 12" and a much fainter 11th magnitude partner at 50".

A favorite of mine is Lambda, which marks the "head" of Orion. This double consists of a pair of mag 4 and 6 stars separated by 4.4". A magnification of 100X should split this duo and reveal a subtle color contrast. For a striking color contrast, take a look at Rho Orionis. A mag 4.6 yellow-orange primary has a mag 8.4 buddy at 7" separation. This color and magnitude difference should be quite obvious at 100X.

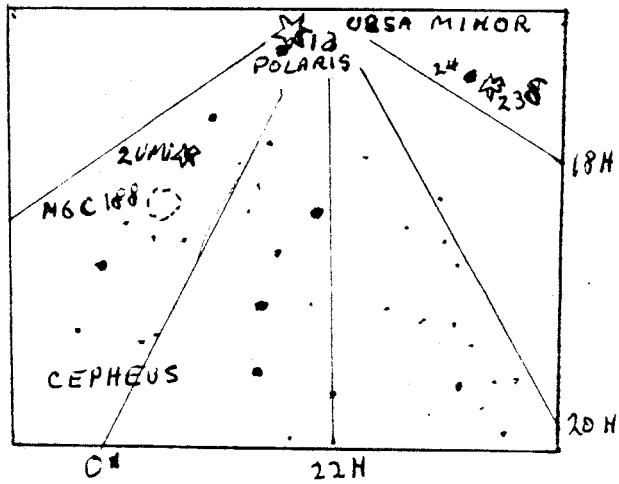
Now, if the seeing is quite steady, let's tackle a few challenging pairs. First off try for Eta, which consists of a mag 3.8 primary with a 5th magnitude companion just 1.5" distant. Due to close separation and fairly large magnitude contrast this is a good test object for small scopes. This pair is stunning when split at high magnification and I resolved it cleanly with a 5" mask at 220X in rock-steady skies at Fremont Peak. A similar challenge is Zeta Orionis which marks the southeastern end of Orion's belt. Here we find a bright 2nd magnitude primary with a 4th magnitude companion hiding out just 2" away. If the seeing is steady, crank up the power and you should be rewarded with an amazing sight. Again, I've accomplished the trick with a 5" mask on my 13" Odyssey 1 at 220X.

One of the most difficult challenges in Orion can be faced at Σ728 (32 Orionis). Here you'll find a mag 4.5 and 5.8 duo separated by just 0.9". My C-8 working at 400X was able resolve this pair one night in 1981 at Fremont Peak into two cleanly separated disks and I was very surprised to find the faint companion appearing tangent to the primary at 360X with a 5" mask.

Finally, the most exquisite multiple in Orion, Theta 1, is located in a remarkable setting-the heart of M-42. Four bright stars, mag 5.4, 6.8, 6.8, and 8.0, dubbed the Trapezium are immediately visible at low power in any scope. If the seeing is steady and fairly dark, you should be able to make out that two of these stars are themselves 4" doubles with faint companions of 11th and 12th magnitudes-for a total of 6 in this system. Of course, now that we've ended our tour in the finest emission nebula in our skies, take a long gaze at its wonder and beauty.

NGC 188, THE OLDEST KNOWN OPEN CLUSTER -- by Gordon Ridley

Next time you are at the star party on Mt. Tamalpais take a look at something special. Far from the galactic plane and only 4^{o} from Polaris, in the constellation of Cepheus, lies the faint, old, old, old, open star cluster NGC 188. Located 1^{o} south, and slightly west of 2-UMi, the star immediately below Polaris, this cluster is slightly over 5,000 light years distant and about 2,000 light years above the north side of the galactic plane. Burnham estimates its age to be some 12 to 14 billion years, the oldest of all the open clusters. The most massive stars in NGC 188 have long since burned out and the brightest stars now are red giants, the highly luminous blue giants being long gone. NGC 188 is a challenging object and a dark sky is preferred. Of its 200 or so stars only about a dozen or two are bright enough to be seen in a small telescope as no member is brighter than 10th magnitude. NGC 188 is classified as a very large, faint, rich, open star cluster, with a diameter of 15'. It has been the subject of much study by astronomers, for such old open clusters are quite rare (and not to be confused with old globular clusters). Most old open clusters have been disintegrated by tidal action during encounters with giant molecular clouds while passing through the galactic disk.



While you are polar aligning your SCT or using your Dobsonian to check out that double star Polaris, dont miss this opportunity to take a moment and see if you can pick up this granddaddy of all the open star clusters.

NAKED EYE GALAXIES

How many galaxies can you see with your naked eye? Of the billions of galaxies in the universe, only four fall into this category. In the San Francisco area however, only two are visible, one of which is our own Milky Way galaxy and includes every star that you can see in the night sky. The other is the great spiral galaxy in Andromeda, which we variously refer to as M31 or the Andromeda galaxy. The remaining two are in the southern sky and are most easily seen from the southern hemisphere, one being the Large Magellanic Cloud (a small satellite galaxy to the Milky Way), and the other, the Small Magellanic Cloud (an even smaller satellite galaxy to the Milky Way).

(For a real naked eye test, see if you can spot M33, the Great Spiral in Triangulum. You'll need a very dark sky and excellent transparency, but it has been done.-Ed.)

HUBBLE'S TROUBLES - by Lewis Carroll Epstein

I have something important to add to the October 1990 Sky and Telescope's Focal Point editorial on the Hubble Space Telescope's, H.S.T., troubles.

The column rightfully holds NASA and Perkin-Elmer/General Motors responsible for the failure. But the telescope was not built for NASA. It was built for the professional astronomers. That is, the professional astronomers were the customers. Why didn't one of them insist on an actual measured figure of merit for the telescope? If a one-of-a-kind custom race car was being built for you wouldn't you ask for an actual horse-power measurement? If a one-of-a-kind hifi system was being built for you wouldn't you ask for a frequency spectrum response test? If you intended to buy and USE a big new or second-hand telescope wouldn't you knife edge test it? Or at least look at a star? The professional research astronomers who didn't demand standard tests must share responsibility for the failure.

In the 1960s (30 years ago!) I worked on the Large Space Telescope project. It was to go into high earth orbit on a Saturn (moon) rocket, riding in the section usually occupied by the Lunar Excursion Module.

I proposed a large high resolution, wide-angle All Reflecting Schmidt to map the far ultraviolet sky. It would have preceded the narrow-field Cassegrain for the same reason the large wide-angle Palomar Schmidt preceded the 200 inch telescope. But many people doubted a Schmidt could be made without a lens. And theoretical analysis wasn't enough to convince them. So the Chrysler Corp. (which wanted to sell Saturns) paid for a prototype. The telescope and I graced a Sky and Telescope cover and test photographs appeared inside. But that wasn't enough. One of the astronauts, the first astronomer astronaut, flew out to the test site, Las Cruces, New Mexico, to see if it was for real. He even came into the darkroom (no CCDs back then) to make sure there was no high contrast monkey business. He was convinced. But not the academic astronomers.

They wanted a "figure of merit." They wanted actual measured Hartman test numbers. I didn't know what a Hartman number was. But I found out and did the tests and measured the film and calculated the numbers all over the field of view. That ended the technical argument. But it didn't end the infighting between the east and west coast astronomers. The west coast astronomers wanted NASA to spend on large earth-based telescopes. While the professionals were squabbling, along came Vietnam and the Space Shuttle. The powerful, reliable Saturn was scuttled and the mechanical drawings of the 150 inch Space Telescope it was to orbit became wall decoration.

Now, thirty years later, you can't help wonder why didn't the professional astronomers ask for actual measured H.S.T Hartman numbers? Why the change? Perhaps because we have entered a new age of superspecialization and faith. Astronomers listen to talk of cosmic strings, false vacuum and complex time, but don't demand to understand them or even expect to understand them. They go on faith--faith in the specialist. They went on faith that the H.S.T. was diffraction limited.

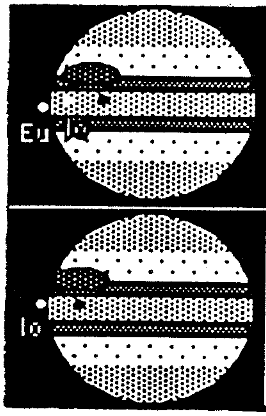
San Francisco Amateur Astronomers

The Randall Museum
199 Museum Way, San Francisco 94114

Now is a good time to look for Jupiter's Great Red Spot and to check out some close encounters of its four Galilean moons.

Just past opposition, the king of the planets is well placed for viewing all evening.

There's more inside.



WATCH IO AND EUROPA CHANGE PLACES!

1:10 AM - Io, ready to exit transit, is hard to see. Europa, easily visible, is ready to enter occulation. Red spot and Io shadow visible.

1:25 AM - Now it is Europa which is invisible behind Jupiter. Io is clearly visible, having just emerged from transit. Io shadow visible just below the red spot, which is at the limb ready to round the corner around Jupiter.