



# San Francisco Amateur Astronomers

c/o Josephine D. Randall Museum  
199 Museum Way, San Francisco 94114

President:	Irving Hochman	641-0770
Vice President	Bob Levenson	468-3592
Secretary/Treasurer:	Chelle Beard	878-4965
AANC Representative:	Nancy Cox	826-2217
Bulletin Editor:	Jim Shields	585-4088
Public Relations:	Douglas Wolfe	386-1876

## BULLETIN FOR JUNE 1989

Date: WEDNESDAY, JUNE 21  
Time: 8:00 P. M.  
Place: Auditorium, J. D. Randall Museum  
Speaker: Dr. Peter Trower  
Professor of Physics, Virginia Tech.  
Topic: "Cold Fusion:  
New Physics or Bad Chemistry?"

Dr. Trower will demonstrate for us the tabletop cold fusion process.

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We have had many lectures in the past concerning the fusion process in Star formation; but never before have we had the opportunity to observe an experiment dealing with the fusion process. This is what Dr. Trower will present at our June meeting.

He is a graduate of UC-Berkeley (B.A.) and earned his Masters and Doctorate degrees in physics at the University of Illinois. He is a professor of physics at Virginia Tech. Two years ago he came here to work with the late Luis Alvarez and is presently at the Lawrence Berkeley Lab as a visiting scientist. His professional interests include research on Dark Matter and Cosmic Ray data. He is also working on the development of a special camera for photographing airline baggage. In addition, he is co-author, with Dick Carrigan of "Particle Physics in the Cosmos" (Freeman).

## NEXT STAR PARTY - June 3

Our next Star Party is on June 3. In conjunction with this, there will be a special presentation by the Rangers in the Mountain Theater. Mr. Shiloh Unruh will offer a slide show, "Renovation of Lick Observatory."

Bring your family, friends, telescopes, binoculars and spend the evening. The Show starts at 8 P.M. Watch the Sunset, see the Mountain Theater Show and then see the grandest show of them all, the Spring-Summer Sky. We expect to be joined by a group of about 20 second-graders from the San Francisco School. We will meet at 7 P.M. at the Shoreline Shopping Center in Mill Valley and caravan up the mountain together. When you leave the Star Party, don't forget to turn on your headlights BEFORE you leave your parking space. SAFETY FIRST!

## BOARD MEETING

The next meeting of the SFAA Board of Directors is on Wednesday, June 14, at 8:00 p.m. in the library of the J.D. Randall Museum. All members are invited to attend Board meetings to contribute their ideas and suggestions.

## DO WE HAVE YOUR ADDRESS RIGHT?

Chelle Beard is presently updating the SFAA membership roster. If your address or telephone number has changed during the last few years, please contact her at 32 Penhurst Avenue, Daly City 94015 to make sure that she has correct current information.

## DRESS FOR THE OCCASION!

Have you noticed the nifty SFAA sweatshirts that Toney Burkhart, Lisa Puls, Bill Cherrington and other club members have been sporting at recent meetings? They're a great way to call attention to the club and keep warm at the same time. If you'd like one of your own, call Toney at 668-9691 evenings to place an advance order.

## WELCOME ABOARD!

The SFAA takes great pleasure in welcoming seven new members to our ranks: Craig Harrison, Tom Kellogg, Brendan Choi, Tom Martin, Thomas Considine, Kathy Unger and John Doyle. We hope to see you often at the club's meetings and star parties.

## IF YOU MISSED THE MAY MEETING

You missed a fascinating talk by Dr. Joseph Silk. Thanks again to Dr. Silk for his lucid explanations of current theories of the past, present and future of the universe. His recently revised and updated book, The Big Bang, is highly recommended.

## STAR PARTY REPORT - By Irving Hochman

Our May 6 Star Party was both a big bust and a great success! "How can that be?", you say. Well, here's how. The weather, which had been beautiful for days before the event, turned on us with patchy high clouds, tantalizing us with brief, clear periods and frustrating us with enough general overcast to make it impossible to see anything for more than a few fleeting moments at a time.

It was very disappointing to us and to the 77 psychiatrists who came to see the celestial sights. They arrived early and were ushered by Toney Burkhart into the Mountain Theater where Ranger Randy Hogue presented a slide show and talk on the Sun, its energy generation and effect on life functions. He also covered such topics as the size of the universe, relative distances between stars and galaxies and distribution of galaxies.

In the meantime our group of members was setting up telescopes at Rock Springs (next door to the Mountain Theatre). We had a wonderful turnout of our members who brought about 15 telescopes ranging in size from 3" refractors to 16" reflectors, with everything in between in RFT's and Dobsonians.

After the Rangers' show, the APA group joined us at our Site. They enjoyed the few glimpses we had of the sky, and they were especially interested in the telescopes themselves. Although it was cloudy, it was warm and very pleasant just being there and talking about astronomy. So, in that sense, the evening was very successful.

Special thanks for great help in organizing the fine array of telescopes are due to Toney Burkhart, Bill Cherrington, Bob Levenson, Joel Goodman, John Muhilly, Pete Pavlukevich and many other members and guests. But the bouquet of this piece goes to Nick Kanas, who as a member of both the SFAA and the APA, originated and developed the idea of the Star Party as one of the recreational activities for the psychiatrists during their convention in San Francisco. He was aided and ably abetted by Toney in this project which was started while Toney was president of SFAA.

### BULLETIN CONTRIBUTIONS

As always, the Bulletin welcomes your announcements, letters to the editor and articles on astronomy. Send them to: SFAA Bulletin, C/O Jim Shields, 190 Chilton Avenue, San Francisco 94131. The deadline is the 18th of the month.

### SFAA MEMBERSHIP BENEFITS

Membership dues of \$15 per year include the monthly SFAA Bulletin and free entry to all club activities, such as lecture meetings, star parties, summer picnics, etc. In addition you may obtain subscriptions to several astronomy publications at greatly-reduced rates. Please contact Chelle Beard at 32 Penhurst Avenue, Daly City 94015. Telephone 878-4965 evenings.

## JUNE EVENTS!

- 1 - Moon at perigee (226,420 miles from Earth).
- 3 - New Moon, 12:53 p.m. PDT.
- 4 - Venus  $3^{\circ}$  south of Moon.  
Mercury stationary.
- 6 - Mars  $1.6^{\circ}$  south of Moon (11 a.m. PDT).  
Mars passes  $5^{\circ}$  south of Pollux in the evening.
- 9 - Jupiter in conjunction with Sun, will emerge into morning sky at month's end.
- 11 - First Quarter Moon.
- 12 - Moon at apogee (251, 321 miles from Earth).  
Mars forms a straight line with Castor and Pollux
- 17 - Antares  $0.4^{\circ}$  north of Moon, occultation.
- 18 - Mercury at greatest western elongation ( $23^{\circ}$ )  
Full Moon.
- 20 - Saturn  $4^{\circ}$  north of Moon.
- 21 - SFAA general meeting. Dr. Peter Trower, guest speaker.  
Summer solstice.
- 23 - Mercury  $3^{\circ}$  north of Aldebaran in A.M.  
Saturn passes just 18' south of Neptune tonight and tomorrow night. The two planets appear in the same telescopic field of view for a couple of weeks before and after this date.
- 24 - Venus  $5^{\circ}$  south of Pollux.  
Saturn  $0.3^{\circ}$  south of Neptune.  
Uranus at opposition.
- 25 - Vesta is at opposition.
- 26 - Last Quarter Moon
- 27 - Mars passes through the center of the Beehive Cluster in the evening.  
Venus in straight line with Castor and Pollux.
- 28 - Moon at perigee (229, 261 miles from Earth).

## THE GLOBULARS OF OPHIUCHUS by Steve Gottlieb

As the milky way becomes prominently placed in June, we turn our attention away from the "Realm of the Galaxies" to the wondrous nebulae and star clusters of the summer skies. Among my favorites objects this time of year are the globular clusters-ancient spherical swarms of stars which Hubble showed form a halo around our galaxy. As we gaze towards the center of our galaxy in Sagittarius and Scorpius we naturally encounter more of these objects. The constellation of Ophiuchus is another great place to start as it contains a total of 20 bright NGC globulars. Though a 4"-5" scope will reveal almost all of these, an 8"-16" is really necessary to fully appreciate the splendor of these dense swarms of stars.

The principal challenge for the visual observer is the degree of resolvability into stars for each system. This depends greatly on 2 factors: the degree of concentration of the stellar members in the cluster and the distance to the globular. A third factor which can come into play is the extent of dust in the plane of the milky way along our line of sight to the object. Tightly packed clusters will tend to resist resolution but will have a high surface brightness. This aids some extremely distant clusters such as NGC 2419 in Lynx to be easily visible in an 8" scope although its distance is comparable to the Magellanic Clouds-our 2 neighboring satellite systems. Medium or loosely concentrated clusters may allow a high degree of resolution in an 8" if they are relatively nearby. Some globulars discovered photographically in the past 35 years are visually unobservable due to a combination of a sparse population, extreme distance, and high obscuration of dust in the galactic plane. Nevertheless, about half of the so-called "Palomar Globulars" discovered in the Schmidt survey of the early 1950's are detectable and a description of Palomar 6 in Ophiuchus will be found below.

To compare the degree of resolution in different apertures I've included my notes taken with a C-8, 13.1" Odyssey 1 and 17.5" open-tube Dobsonian. The single most crucial visual factor affecting resolution is the "seeing". On mediocre or poor evenings a globular may be reduced to a large fuzzy blob as the individual images smear each other out. So, wait until those nights or even moments when the atmosphere is calm and then use the maximum power that the seeing will allow. With my C8, I regularly used 200X (25 times the aperture in inches) when the seeing allowed. Finally, since many globulars lie well south of the celestial equator, wait until the object is near culmination to minimize the effects of haze and seeing at low elevations.

M107 (NGC 6171): Even the dimmest of the Messier globulars is fairly bright in my C8. The outer halo appears grainy and a few magnitude 14 stars appear on the NW edge at 220x. The small, bright unresolved core is very prominent in my 13" and the outer halo is resolved into a number of faint stars.

M10 (NGC 6254): The C8 will resolve this symmetrical beauty down to the core. Faint stars cover the bright central region and scores of stragglers stream away from the nucleus in lanes. The core is intensely bright in the 13" and densely packed with resolved stars. In my 17.5" this globular appears fully resolved as hundreds of stars are layered over the entire disc.

M12 (NGC 6218): Although the bright core admits only a partial resolution in the C8, the irregular outer halo highly resolves into layers of mag 12-13 stars with a few brighter stars embedded. The core itself yields to the 13" at high powers and faint stars are scattered over the center. Although M10 and M12 are similar in total brightness their appearance is different and I do not find M10 quite as rich as M10 in faint stars.

M62 (NGC 6266): The C8 reveals a non-symmetrical appearance; flattened in the SE direction due to intervening dust and fanning out to the west where a few faint stars can be discerned. The mottled outer shell just resolves into many faint stars at 288X in my Odyssey 1.

M19 (NGC 6273): Though lively in a dark sky, the C8 only resolves a few faint stars at the north edge at 200x. This globular is clearly elongated north-south in the Odyssey 1, which resolves 1-2 dozen faint stars at high powers, particularly south of the core.

NGC 6293: With the 13" Odyssey 1 a small, bright, compact core is evident at 220x. The mottled outer halo is much fainter than the core but with averted vision about 10 extremely faint stars are resolved. Using the 17.5", 15 to 20 stars can be resolved at 286X and the globular appears on the verge of more extensive resolution.

M9 (NGC 6333): Again, the C8 shows a very grainy disk with a few faint stars resolved around the periphery at 220x, especially on the east side. The unresolved core appears mottled in the 13", but many faint stars are bunched at the edges of the core at 288x, and the outer halo breaks up into numerous stars. Look for the large dark nebula B64 just SW of M9.

NGC 6366: This is a strange object, easily located just 17' east of a mag 4.5 star. Visually, it appears large and diffuse with a low surface brightness due to its loose concentration, although some brighter field stars appear at the edges. I could just make out about a dozen faint stars over the unconcentrated haze in my 13".

M14 (NGC 6402): This cluster lies in a heavily obscured region of the milky way which dims its members and makes resolution difficult with a C8. In my 13", I recorded M14 as fairly large with a moderate central condensation. The outer halo is fairly smooth and a dozen very faint stars are superimposed at 288x. In the 17.5" at Fiddletown over 2 dozen mag 14 and 15 stars are resolved, mostly at the edges of the outer halo and the large disc appears more ragged or irregular.

PALOMAR 6: This highly obscured globular is barely visible on the blue sensitive POSS print at UC Berkeley but is quite prominent on the red print. Using the 17.5" a fairly large but very low surface brightness haze is just visible. Six to eight faint stars are superimposed and there are 3 faint collinear stars just off the south end. The field is easily located as the globular lies just 6' northwest of a mag 8 star. In addition, the huge naked-eye dark rift known as the Pipe Nebula is located immediately to the west.

## GALAXIES GALORE: PART II - by Jim Shields

Last month we looked at the Hubble "tuning fork" diagram illustrating basic galaxy types, some theories of galactic evolution and a few examples of elliptical and lenticular galaxies observable in amateur telescopes. This month we'll be extending our survey to include spiral, barred spiral and irregular galaxies.

### SPIRALS

Spiral galaxies are among the most fascinating objects in nature. Unlike ellipticals and lenticulars, most spirals are rich in gas and dust. New stars are being born within them before our very eyes. It is the presence of bright young stars and nebulae - starbirth regions - that, together with dust lanes, mark out their spiral arms.

Hubble classified spirals into types based upon the relative sizes of their central cores (as compared to their discs), and by how tightly the spiral arms were wound about those central regions. So-called "early" types (classified as Sa) typically have large central cores and tightly-wound spiral arms; "late" types (classified as Sc) have extensive spiral structure, with loosely-wound arms flung out from small central regions. Galaxies classified as Sb fall somewhere in between.

Spirals are still often referred to as "early" or "late" types, even though it is no longer believed that a galaxy's Hubble type is related to its age. The reference is merely to the galaxy's position on the Hubble tuning fork diagram; later types are further to the right.

Most of the bright nearby face-on systems are late (Sc) types. Although the Messier catalog contains two galaxies - M65 and M96 - that Hubble classified as early (Sa) types, neither betrays much in the way of spiral structure in a 17.5" scope. In addition, M65 is highly inclined to our line of sight, making the task even more difficult. Sky Catalog 2000 classifies both galaxies as Sb.

The best example of a type earlier than Sc is probably M81. In a 17.5" scope it has an enormous core, with a single spiral arm visible to the south. In comparison to later types such as M33 and M101, the arm is fairly tightly wound and the bright core is large in comparison to the spiral region. The Andromeda Galaxy (M31), also an Sb, is too highly inclined to our line of sight to permit visual determination of its type, although its dust lanes are beautiful. One might infer from its large central region and well-developed spiral structure that it is probably neither a very early nor a very late type.

Now comes a feast for larger amateur telescopes - the late spirals, including M51, M33, M101 and M83. This is where a big Dobsonian really comes into its own. Through a 17.5" scope under a dark sky, all four are magnificent.

The Whirlpool Galaxy (M51) has the best developed spiral structure observable in an amateur telescope. This is one of those rare instances in which the "live" view is just as impressive as the photographs. The prominent dust lanes make it easy to trace the spiral arms through at least one revolution around

the small bright core and the full extent of the gas bridge to its small irregular companion is visible with averted vision.

In M33 two thick stubby arms form a reversed "S"-shape with the small central region. Compared to M51, the arms are much more loosely wound. Note the prominent knots (bright nebulae, or HII regions), especially NGC 604 at the end of the northeastern arm.

The Pinwheel Galaxy (M101) is the paradigm of a very late spiral, with a tiny nucleus surrounded by a huge faint haze of nebulosity. In a 17.5" scope it is difficult to trace out a coherent spiral pattern; the impression is of many short stubby arms flung out from the small central region. At least half a dozen knots are easily seen under a good dark sky.

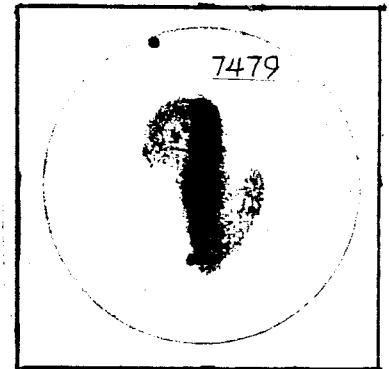
MB3 is often taken for a barred spiral and, in amateur telescopes, it probably best presents the appearance of one. Hubble considered it a transition type (Sc/SBb) but Sky Catalog 2000 classifies it as Sc. In a 17.5" scope it has a nearly-stellar nucleus with bright extensions running northwest/southeast (the incipient bar). One spiral arm is easily visible to the south, running just inside a trio of bright foreground stars.

#### BARRED SPIRALS

Barred spirals are distinguishable from "ordinary" spirals because, in addition to a central nucleus and extended disc, they contain a bright elongated central region (the so-called "bar") out of which their spiral arms appear to grow. Two galaxies in the Messier list - M95 and M109 - are barred spirals but the barred structure is too faint to be made out clearly in most amateur telescopes.

There are only a handful of galaxies in which barred structure can be observed in larger amateur telescopes. The best examples from northern latitudes are probably NGC 1300 in Eridanus and NGC 7479 in Pegasus. Both are classified as SBb in Sky Catalog 2000, making it difficult for an amateur to try to distinguish between early and late types.

In a 17.5" scope NGC 7479 is a long bright thread of nebulosity with a brighter nucleus. One might take it for a normal spiral seen edge-on, were it not for the large surrounding oval-shaped haze. NGC 1300 is similar in appearance, but larger and more diffuse. With careful inspection one can just make out the roots of two spiral arms growing out of the ends of the bar in each galaxy. Averted imagination may help.



#### IRREGULARS

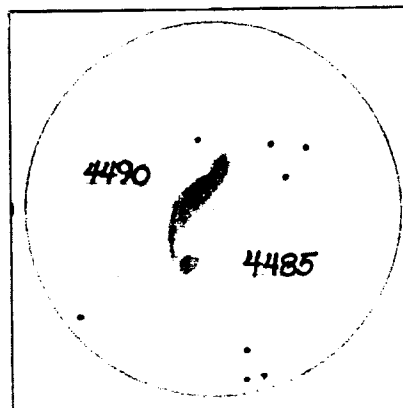
This is the category for galaxies that don't fit into any of the other Hubble classes. Irregular galaxies are particularly interesting to observe because they present such a variety of peculiar appearances.



The most popular irregular is undoubtedly M82, observable in any amateur telescope and even binoculars. Its appearance is cigar-shaped, with several dark bays and bands crisscrossing the disc obliquely to its major axis.

Like stars, galaxies often come in interacting pairs. The most popular examples are undoubtedly M81/M82 and the Whirlpool (M51). Typically, these pairs are most often composed of a late (Sc) spiral with a smaller irregular companion. In addition to M51, the constellation of Canes Venatici contains two other interacting pairs - NGC 4485/90 and NGC 4631/4656/7 - that are particularly interesting in larger amateur telescopes.

NGC 4490 is a bright (mag 9.8) Sc spiral with a pronounced "S"-shape and a bright central core. Its extended northwestern arm seems to curve back toward NGC 4485, a 12th magnitude irregular in the same field. In his Atlas of Peculiar Galaxies, Halton Arp describes the pair as a "double galaxy with connected arms." Using averted vision (or is it averted imagination?), the entire length of the connecting gas streamer is suspected in a 17.5" scope. What do you see?



NGC 4631 is another bright (mag 9.3) late spiral in Canes Venatici, this time with two apparently interacting companions. It's known as "the Club" because of its asymmetrical shape - thicker and lumpier at one end. Look for a small 12th magnitude elliptical (E4p) companion just to the north. (Don't confuse it with the bright foreground star on the edge of NGC 4631 itself.)

The Club's other interacting companion - NGC 4656/7 - lies about a degree away to the southeast. NGC 4656/7 is a very peculiar-appearing galaxy, indeed. Not only is the southwestern half of the galaxy much brighter than the other side, the brighter half is twisted back upon itself at a sharp angle, giving the galaxy its popular name of "the Hook."

Finally, NGC 5128 (Centaurus A) is a marvelous sight in a 17.5" scope, even from northern latitudes. Its core looks like a giant elliptical, with a bright spherical shape, but this core is bisected by a broad irregular dark lane of gas and dust in which several foreground stars (and a supernova in 1986) are visible. Centaurus A is an enigma, combining as it does many of the characteristics of both ellipticals and spirals. Hubble classified it tentatively as "(E0 + Sb)?", although Sky Catalog 2000 calls it a peculiar lenticular (S0p). Some later astronomers have followed Hubble in speculating that what we are seeing here is the result of a merger of two galaxies, in which an elliptical swallowed up a spiral, leaving only its dust lane behind as visible evidence of the galactic "cannibalism".

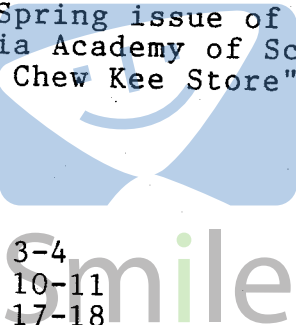
This article has done no more than touch upon the innumerable riches of the night sky just waiting for you to discover in your own telescope. Let us know about your own favorites!

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Look for the lovely tribute to John Dobson in the April issue of Smithsonian. "He only wants to sell you the stars, and they won't cost you a dime."

The Spring issue of Pacific Discovery, published by the California Academy of Sciences, contains an interesting article: "The Chew Kee Store", about Fiddletown during the Gold Rush.



	<u>Twilight</u>		<u>Moon</u>
	<u>Eve</u>	<u>Morn</u>	
June 3-4	2218	0354	Sets @ 2059
June 10-11	2224	0351	Sets @ 0118
June 17-18	2228	0350	Rises @ 1940
June 24-25	2229	0352	Rises @ 0021