SAN FRANCISCO
AmateurAstronomers
SHARING THE WONDERS OF THE UNIVERSE

August 1993

Information Line Number: (415) 905–6445

The SFAA Board of Directors meets on the second Wednesday of every month at 7:00 P.M. at the Western Addition Public Library, 1550 Scott Street at Geary. All club members are welcome at Board meetings.

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, sketches and articles on astronomical subjects. Please send your contributions to: SFAA Bulletin Editor, 190 Chilton Avenue, San Francisco 94131. Deadline is the 18th of the month before publication.

Mapping Massive Stars at Hat Creek

The San Francisco Amateur Astronomers holds lecture meetings on the third Wednesday of each month at 8:00 P.M. at Morrison Planetarium, California Academy of Sciences, Golden Gate Park. At the next monthly meeting on **August 18**, the speaker will be William J. Welch, Director of the Radio Astronomy Laboratory at UC Berkeley. His talk is entitled *Mapping the Formation of Massive Stars with the Millimeter Wavelength Array at Hat Creek.*

Doctor Welch is Professor of Astronomy and Electrical Engineering at UC Berkeley. He has also been Director of the Radio Astronomy Laboratory (RAL) since 1972. The RAL operates the Hat Creek Observatory, where the principal instrument in operation is a Millimeter Wavelength Array.

The Array is operated jointly by UC and members of the Astronomy Departments of the University of Illinois and the University of Maryland. It is currently undergoing an expansion from three antennas to nine, and has passed a major milestone at six antennas.

Among the various observing programs conducted with the Array, the study of newly formed massive stars imbedded in dust clouds is especially interesting. Doctor Welch's talk will focus on the properties of this unusual telescope system and some results concerning star formation.

Mount Tamalpais

The San Francisco Amateur Astronomers (SFAA) holds monthly star parties at Rock Springs on Mount Tamalpais on the Saturday nearest the New Moon. The next SFAA star party is on **August 14**, beginning at dusk. At 8:30 Yvonne Pendleton of NASA Ames Research Center will be speaking in the nearby Mountain Theatre. Her talk is entitled, *We Are Stardust.* Tinka Ross and Dennis Tye are in charge of the August star party.

Be careful where you put your hands in the dark; a live scorpion was found near the restrooms at Rock Springs in June.

The Stars of Summer

The star chart on page nine of this issue contains more than thirty constellations that are visible in the summer sky. How many can you identify? (For extra credit, draw in the outlines of the major constellations.)

Double Vision

Have you ever tried to show a friend the stars in the Summer Triangle? Or the keystone of Hercules? or the location of the beautiful double star Albireo in Cygnus? It's tough, isn't it, to describe locations in the sky with words? Pointing with your finger doesn't really help much.

SFAA member Ray Cash–Le Pennec is now making a handy little device called *Double Vision* that solves this problem very handsomely. *Double Vision* is essentially a pair of collimated Telrads—two illuminated bulls–eyes pointed at the same spot in the sky, one for you and one for your friend. Aim yours' at a bright star, and your friend will immediately see exactly where you are looking.

Double Vision was inspired by *Skywalker*, a similar device made by Randall J. McClelland of Quincy, Ill., and reported in the October 1988 issue of Sky & Telescope. So Ray didn't invent the idea, but he has done a beautiful job putting together these handy little units. (The nicest thing about them is their lovely hardwood finish.) At last report he was selling them for $35 each and had a few left. To get one of your very own, call Ray at 665–8639.

Star charts in the SFAA Bulletin are based upon The Sky for Windows available from Software Bisque. Photographs are from The Buil–Thouvenot CCD Atlas of Deep Sky Objects available from Sky Publishing.

The Edge of the Solar System

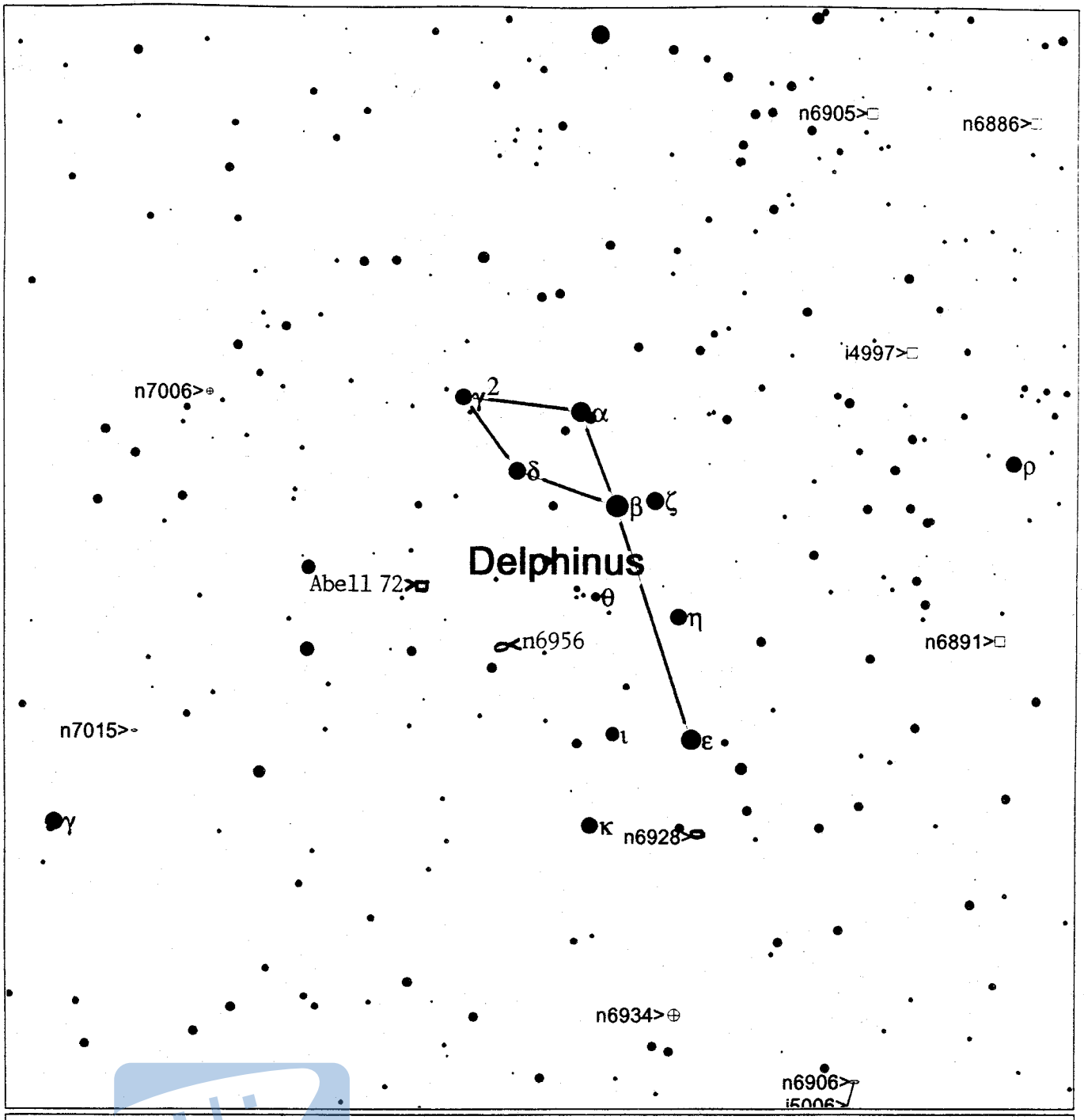
—Joel W. Goodman

Where does the solar system end and interstellar space begin? Your knee jerk response would probably be just beyond the farthest point of Pluto's orbit, about 50 times Earth's distance from the sun, or 50 astronomical units (AU). Planetary astronomers might be inclined to agree with that demarcation, but space physicists would go farther out, indeed much farther out, to where the tenuous solar wind, ionized gases blown off the sun, runs smack into another wind, the similarly tenuous interstellar medium through which the solar system travels. Exactly where these winds collide, a boundary designated the heliopause, has been hotly debated, with estimates as far out as 1000 AU. Now, thanks to the two Voyager spacecraft launched in the mid to late 1970s, we have a clue as to the location of that faraway place.

The Voyagers have now traveled more than 50 AU from the sun, or beyond Pluto's orbit, and have recently detected a strong radio signal believed to result from a solar wind "gust", generated by an upsurge in solar activity, colliding with the interstellar medium at the putative boundary. The timing of the signal---1.1 years after the solar outburst was observed---indicates a heliopause at about 120 AU (range 80-160 AU), almost 2.5 times the distance of Pluto, but much nearer than the more extravagant estimates of its distance. The calculation of this distance can be likened to estimating the distance to a wall by throwing a rock against it and waiting for the sound of the impact. If the average speed of the rock, the speed of sound and the elapsed time are known, the distance to the wall can be calculated. The burst of solar activity occurred about the beginning of June in 1991 and the consequent stream of ionized plasma swept past the Voyagers at speeds of 600-800 km/sec in September of that year. The "rebound" signal was picked up 1.1 years after the original burst of activity on the sun.

How certain can we be that the radio signal detected by the Voyagers actually emanated from the heliopause? The only other plausible source of the noise is Jupiter, which is known to be a powerful radio transmitter. However, it is highly unlikely that Jupiter, with an emission strength of 6 billion watts, could be responsible for the observed signal. The two Voyagers, though widely separated in space, detected the signal at roughly the same strength, indicating that the source had to be generating more than 10 trillion watts, dwarfing Jupiter's transmission strength. The signal, therefore, bears all the hallmarks of a collision between a shock wave in the solar wind and the heliopause.

Will any of our spacecraft reach the heliopause in working order? There are 4 vehicles launched during the 1970s that are presently in the outer reaches of the solar system and cruising toward interstellar space. Unfortunately, all 4 are gradually dying as their radioisotope-driven generators wind down. Pioneer 11 will shut down within the next few years, and Pioneer 10 will follow by the end of the decade. The Voyagers are better off and should last until 2015 to 2020. In 2020, Voyager 1 will be at 148 AU and Voyager 2 at 123 AU. Thus, if the heliopause is really within 150 AU we stand a pretty good chance of the Voyagers signalling us from the edge of the solar system.



EXPLORING DELPHINUS

Stars:

9.5	5.0
9.0	4.5
8.0	3.8
7.5	3.1
7.0	2.8
6.0	2.5
5.6	2.0
5.3	1.0

NGC Objects:
- Galaxy
- Open Cluster
- Globular Cluster
- Planetary Nebula
- Nebula
- Cluster+Nebulosity
- Star
- Other NGC Objects

Solar System Objects:
- Sun
- Mercury
- Venus
- Mars
- Jupiter
- Saturn
- Uranus
- Neptune
- Pluto
- Moon
- Comet
- Asteroid

Center at: RA: 20h42m Dec: +13d49' Date: 08/17/93, Time: 10:00 PM

Exploring Delphinus

by *Steve Gottlieb*

Although small in stature, Delphinus the Dolphin has always been one of my favorite summer constellations because its five brightest fourth magnitude stars form a striking "kite" and "tail" asterism easily seen about 10° northeast of Altair. Located at the eastern edge of the milky way, Delphinus includes three interesting planetaries, two globular clusters and roughly two dozen faint galaxies to explore with larger scopes. Before heading out in search for the deep sky fare, make sure you first take a look at Gamma Delphini, the northeast star in the "kite", a beautiful pair of mag 4.5 and 5.5 stars with a comfortable separation of 10".

N6891: This unusually high surface brightness planetary shows a bluish color in my 17.5". At 140X, a striking uniform small oval disc of 15"x10" is visible. Jacking up the power to 410 reveals a brighter center or the embedded central star.

N6905: A larger but lower surface brightness planetary than N6891. At 280X, the faint central star can be picked out and a slight elongation is evident. Look for 2 stars just off the northeast and south edges.

N6928: The brightest galaxy in Delphinus is difficult in a 8" scope. My 17.5" reveals a pretty edge-on system oriented WNW-ESE, with a bright core. A 13th magnitude star is superimposed on the north side. If you're successful with this galaxy then look for the faint companion galaxies NGC 6927 just 3' west and NGC 6930 4' southeast.

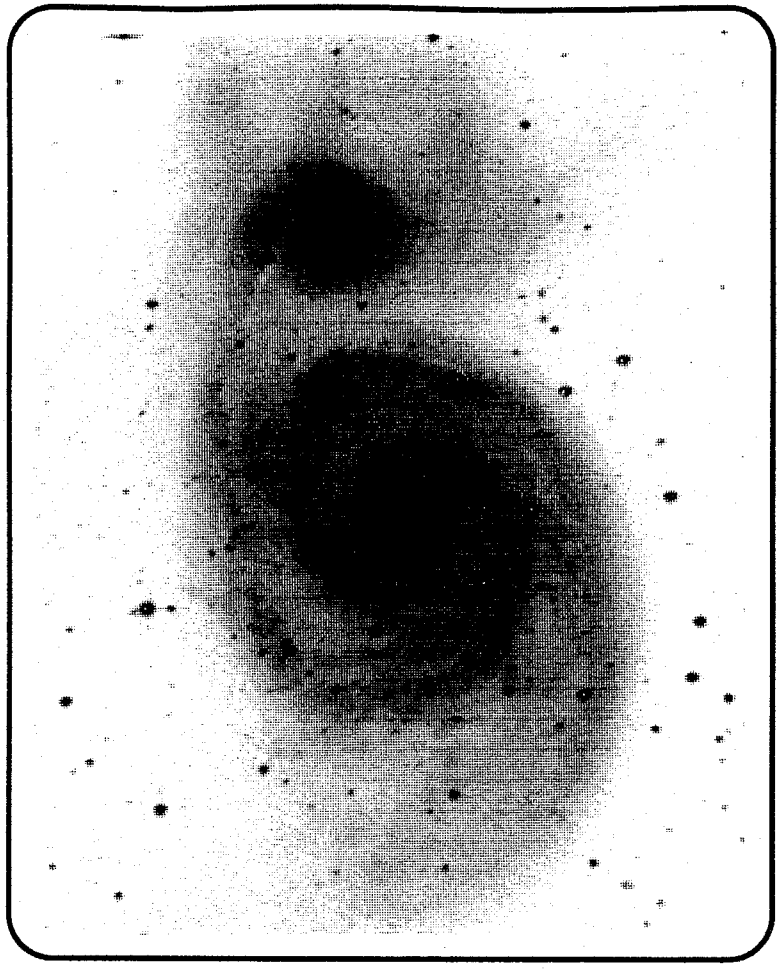
N6934: The brighter of 2 globular clusters in a pretty sight in any scope. At 400x, it appeared clumpy in my old C-8 but with no individual resolution into stars. My 13", though, partially resolved the outer halo into 15-20 stars mainly south of the bright core

N6956: This galaxy can also be picked up with an 8" scope, although a 8.5 magnitude star of the east edge interferes with viewing. With a 13", this diffuse galaxy extends west of the bright star and has an even surface brightness. N6956 is also the brightest in a small group. See if you can locate UGC 11620 in the same field 7' south-southeast. A 12" or larger scope should do the trick.

Abell 72: A good introduction to the class of Abell planetaries. This one is about 120" in diameter and shows up best at low power using an O111 filter. With my 17.5" it is easily visible just east of an 8th magnitude star while a 9th magnitude star is just 4' north! The edges are not crisp but the general outline appears irregular. A couple of 11th magnitude and a 13th magnitude star are just off the east edge. Another 13th magnitude star is superimposed in the center but it may not be the central star.

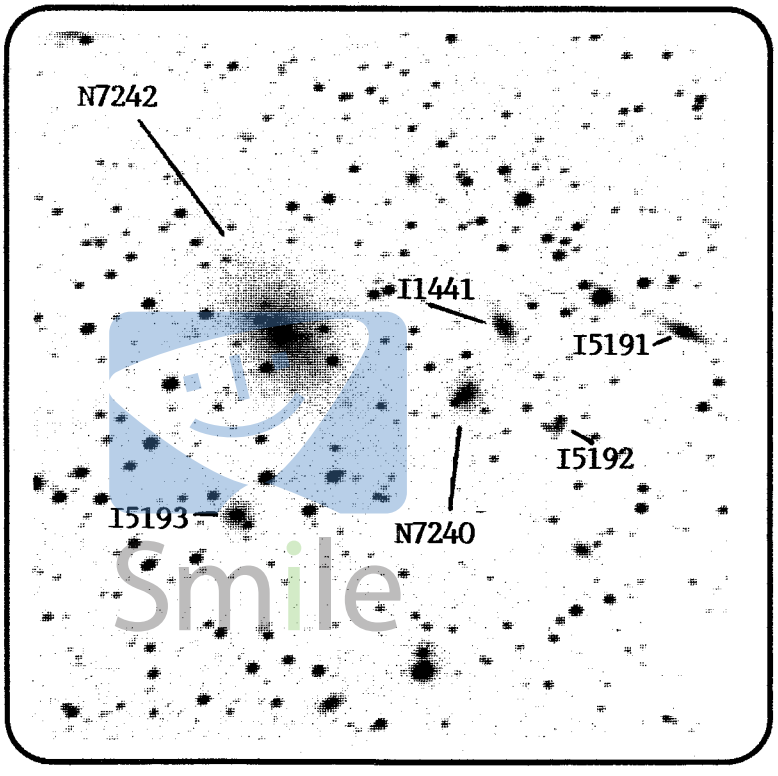
N7006: One of the most distant globulars, yet its fairly high surface brightness allows it to be viewed in 6" scopes. In a 13", a small bright core is evident surrounded by a small fainter halo with appears mottled and clumpy. Under good seeing, you should just start to resolve the cluster with this aperture.

Name	Type	Class	RA	Dec	Size	PA	V Mag	B Mag	U2000	NGC Description
N6891	PN	2a(2b)	20 15.2	+12 42	15"		10.5		208	stellar=9.5m
N6905	PN	3(3)	20 22.4	+20 07	47"x37"		11.1		163	B,pS,R,4S* nr
N6927	GX	S0	20 32.6	+09 55	0.9x0.4		14.5	15.5B	209	eF,lE
N6928	GX	SBab	20 32.8	+09 56	2.0x0.6	106	12.2	13.6B	209	pB,pL,mE
N6930	GX	SBab	20 33.0	+09 52	1.3x0.5	8	12.8	13.6B	209	F,mE
N6934	GC	8	20 34.2	+07 24	5.9		8.9		209	B,L,R,rrr,*16...
N6956	GX	SBb	20 43.9	+12 31	1.9x1.9		12.3	13.1B	209	vF,S,stell,** att
U11620	GX	S:	20 44.2	+12 25	0.6x0.4	25	13.6	14.6B	209	
Abell 72	PN	3b	20 50.1	+13 33	134"x121"		13.8		209	
N7006	GC	1	21 01.5	+16 11	2.8		10.6		209	B,pL,R,gbM



White Mountains

From Grandview campground the view of the Whirlpool Galaxy through a 24–inch scope was the best I've ever seen. The gas bridge connecting the two galaxies was visible with direct vision and the spiral arms were full of fine detail.



From the Barcroft parking lot at 12,500 feet, using a 17.5 inch scope, there were six galaxies visible in the NGC 7242 group in Lacerta. The four IC galaxies in the group are about magnitude 15.5–16.

A Field Trip to the White Mountains

—Jim Shields

I've always been curious about just how good the observing might be from a remote high altitude site such as the White Mountains, haven't you? In July I had a chance to find out, when Steve Gottlieb and I attended the field trip sponsored by the Tri–Valley Stargazers of Livermore and organized by David Rodrigues.

Steve and I left the Bay area on Wednesday morning, July 14, and drove as far as Saddlebag Lake, just past Tioga Pass, where we camped that night. (Later, we learned that the pass was closed a few hours later because a Ranger had been shot in Yosemite.) The campground, at 10,000 feet, had just opened the day before and there were still snowdrifts not far from our tent! We broke out Steve's scope for a couple of hours' observing. Boy, was it cold!

The next day we continued on to Grandview Campground in the White Mountains. I had always thought of this site as being at the ends of the Earth; actually it's only 19 miles northeast of Big Pine and an easy drive (when the road is open). We were a little surprised because there was almost no one else there except for SFAA members Ken and Kathy Archuleta, who had spent the week fishing at June Lake. (Several other participants had been turned back at Yosemite and had to detour through Sonora Pass.)

The views are grand from Grandview, both by night and day. Only a couple of miles up the road there's a stunning view of the eastern Sierras from Mount Whitney to Yosemite in the daytime. When darkness falls, the Milky Way is equally wonderful, amazingly bright, extending far outside its usual boundaries, full of intricate dust lanes and bright HII regions.

On Friday we proceeded another 25–30 miles up the mountain over a rough dirt road for two nights of observing at Barcroft Laboratory, a research facility maintained by UCLA at 12,500 feet, only about five miles from the summit itself. (Just as we were about to pull out, who should show up but another SFAA member, Carl Trost, fresh from the field trip to Glacier Point.)

As Dave Rodriguez says, "Barcroft is a little bit like Shangri–La and a lot like an Antarctic Research Station." There were oxygen tanks in the dining room and we were encouraged to monitor the oxygen saturation of our blood. The altitude affected every participant differently; some had severe headaches, couldn't sleep at night or spent much of their time gulping oxygen. I was lucky: the altitude didn't bother me at all; I even managed a ten mile round trip hike to the summit on Saturday. (Carl Trost tried it on Sunday; did you make it, Carl?)

So, how was the observing from 12,500 feet? Spectacular! Comparable to the Texas Star Party, where the Milky Way throws a shadow! Make the trip at least once in your life, and don't miss the bristlecone pine forests on the way! Contemplating the oldest living things on Earth perfectly complements observing the infinities of space and time through a telescope.

However, the combination of altitude and cold limited our observing at Barcroft to 3–4 hours a night and probably also adversely affected our retinas. At any rate, the observing was nearly as good, and much more comfortable, thirty miles back down the road, and 4,000 feet lower, at Grandview. Steve and I are already thinking about an SFAA star party there next July or August.

COMET COMMENTS

07-07-93

Two faint returning comets have been recovered lately. Other than that, comet activity remains low. Don't forget the Perseid Meteor shower on the night of Aug. 11-12, this is the result of Periodic Comet Swift-Tuttle, observable late last year.

Periodic Comet Hartley 3 (1993m): Jim Scotti of Kitt Peak recovered this comet on June 23 at magnitude 20. It has a 6.8 year orbit, it will be closest to the sun next May at 2.5 AU, but is not expected to get much brighter.

Periodic Comet Whipple (1993n): Jim Scotti also recovered this comet. It is 18 months from a distant perihelion. It has a 8.5 year orbit and will not become visible in amateur scopes.

Periodic Comet Shoemaker-Levy 9 (1993e): This "string of pearls" comet, set to collide with Jupiter next July, is in a near-circular orbit. The positions below are from the latest orbit. The comet will pass behind the sun in October, we'll see it again in the morning sky in late December.

EPHEMERIS

PERIODIC COMET SHOEMAKER-LEVY 9 (1993e)

DATE(00UT)	R.A. (2000)	DEC.	ELONG	SKY	MAG
07-22	12h20.5m	-03°21'	67°	E	14.4
07-27	12h23.1m	-03°37'	63°	E	14.4
08-01	12h25.9m	-03°55'	59°	E	14.4
08-06	12h28.8m	-04°13'	55°	E	14.4
08-11	12h31.9m	-04°33'	51°	E	14.5
08-16	12h35.1m	-04°53'	47°	E	14.5
08-21	12h38.5m	-05°14'	43°	E	14.5
08-26	12h41.9m	-05°36'	39°	E	14.5
08-31	12h45.5m	-05°58'	35°	E	14.5
09-05	12h49.2m	-06°21'	31°	E	14.5

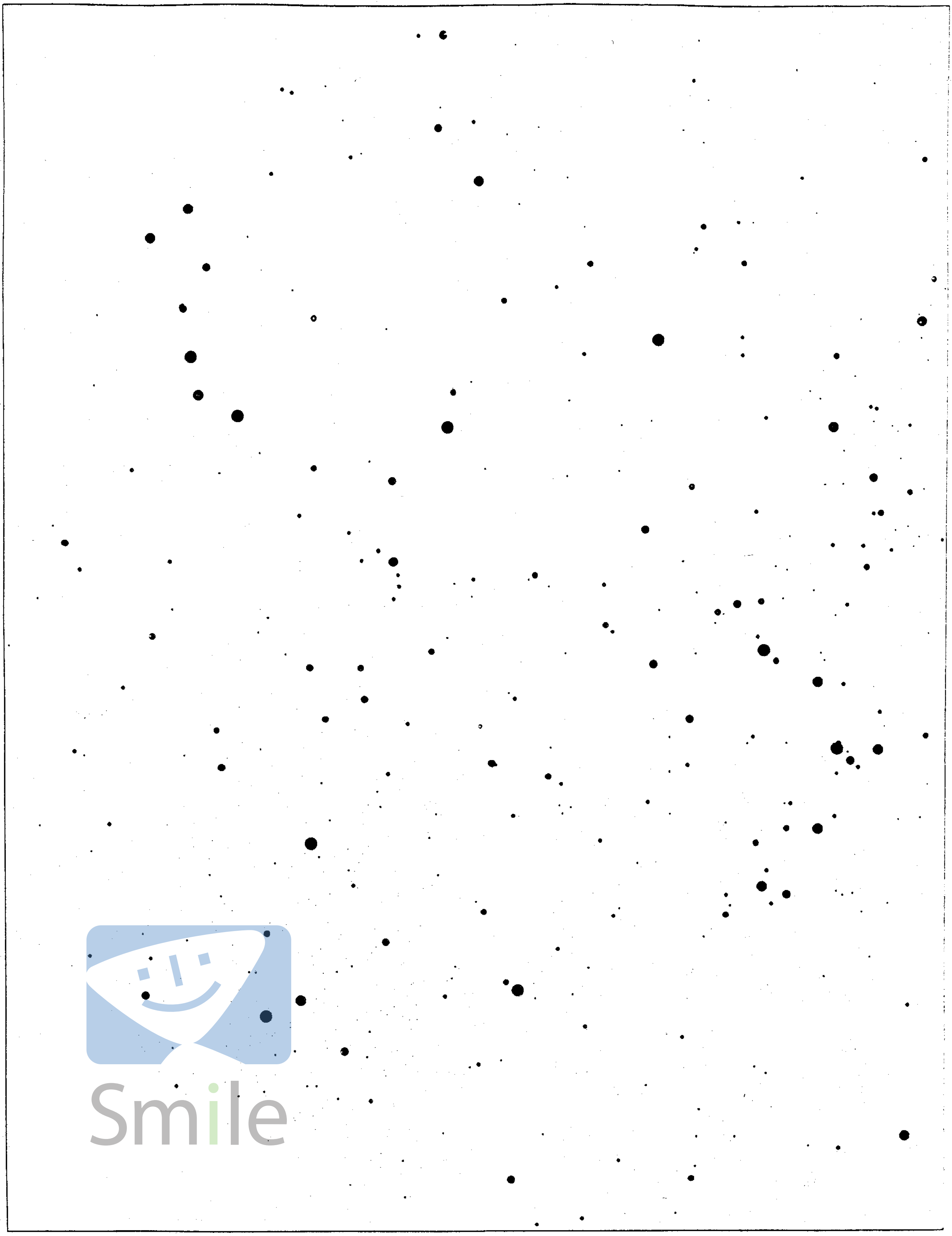
SEEKING COMETS

It has been more than seven months since an amateur has discovered a comet. This is not unusual, as a look at other amateur comet discovery "droughts" since 1975 shows absences of comet finds.

18.0 months: Mar. 3, 1976 to Sept. 4, 1977
17.8 months: Dec. 26, 1980 to Jun. 18, 1982
11.5 months: May 27, 1985 to May 12, 1986
10.5 months: Jun. 18, 1982 to May 4, 1983
8.5 months: Oct. 10, 1978 to Jun. 24, 1979
7.7 months: May 12, 1986 to Jan. 5, 1987
7.5 months: Jan. 6, 1989 to Aug. 24, 1989
7.2 months: Dec. 25, 1979 to Jul. 31, 1980

With 63 visual finds during this time period, on the average a new comet would be visually discovered every 3.3 months.

Don Machholz (916) 346-8963



THE STARS OF SUMMER

San Francisco Amateur Astronomers
c/o Morrison Planetarium
California Academy of Sciences
Golden Gate Park, San Francisco, CA 94118

Features

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San Francisco Amateur Astronomers

Membership Application

Name: ______________________ Telephone: ______________________

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Select one category:

- ❑ $20 enclosed, **individual** membership
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- ❑ $5 enclosed, **youth** membership (under 18)

Make checks payable to **San Francisco Amateur Astronomers** and mail to:
Treasurer, San Francisco Amateur Astronomers, 1414 Terra Nova Blvd., Pacifica, CA 94044.

Founded in September 1952, the San Francisco Amateur Astronomers (SFAA) is an association of people who share a common interest in astronomy and other related sciences. Our membership consists of people from all walks of life, educational backgrounds and ages. Many SFAA members own their own telescopes; some have been made by hand in local telescope-making classes and vary in size from 6 to 25 inches diameter.