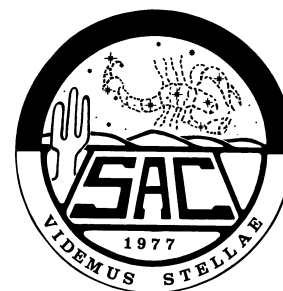


Saguaro Astronomy Club

Metro Phoenix, Arizona

SACNEWS



November 1993 — Issue #202

v10.20

Kissing a Nagler

by M. Leon Knott

Let the talk turn to eyepieces and even the most shy of amateurs is apt to offer an unsolicited opinion as to quality, use and so on. Stir light pollution filters into the equation and the gentle conversation is likely to evolve into a verbal fray, with as many different opinions as there are amateurs present. In fact, you'll find less vehemence, certainty and downright hardheadedness in even a rous-

**These impressive hunks of glass
and aluminum embody a pleasing
mix of high ergonomic quality
and plain down-home snobbery**

ing political debate among these dedicated surveyors of the universe. After all, the immediate concern of "which eyepiece is the best" is of far more importance to the telescope user/owner than who shall be running the country four the next four years. A bad choice in an eyepiece can affect the apparent visual quality of the universe and the amateur's inner peace far more and for much longer than mere selection of a president and his associated gang of politics.

Furthermore, the eyepiece debate is likely to take off in many different directions at once. On the one hand, old simple eyepieces are best for long focus refractors, or else, new complex eyepieces are best for long focus refractors. On the other hand, wide-field eyepieces are best used on reflectors with focal ratios from around $f/4$ to $f/5$, or perhaps on compound telescopes with focal ratios near $f/10$. In short, coming to a sensible unanimity as to eyepiece quality and use is very nearly impossible. And a true consensus can be managed only when sought in a crowd of one amateur at a time.

Quick Calendar

SAC Deep Sky Meeting

Constellation: Pisces

7:30, Thursday, November 4

SAC Star Party

Buckeye Hills Recreation Area

Saturday, November 6

SAC Meeting

7:30, Friday, November 19

Membership Renewals Are Due

See Member Services Form on the back page.

Officer Elections This Month

However, when the talk turns to price and pride of ownership, there are few possessions equaling that of a good, big set of Nagler eyepieces. These impressive hunks of glass and aluminum embody a pleasing mix of high ergonomic quality and plain down-home snobbery (as in "How many Naglers so **YOU** have? Heh! Heh! Heh! Wanna see mine? Heh! Heh! Heh!") Even amateurs of modest mathematical ability seem to become arithmetic prodigies when turning glassy eyes upon a neighbor's collection of eyepieces, with numbers flowing like wine. "You like this old 12mm Nagler Type Two with its 12mm's of eye relief do you? Well, uh hum, in my experience, which I'll admit is rather extensive old boy, I find the 13mm Nagler with its admirable eye relief of 17mm, giving a magnification of 115 on a properly built telescope, to be the superior eyepiece of the bunch, don't you see..." Ah, what

SAC Officers

President	Bob Dahl	582-5526
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SACNEWS Editor	Paul Dickson	841-7044
Public Events	Piet Burggraaf	995-1964

THIS IS A 100% MATTER NEWSLETTER

In the Unlikely Event That This Newsletter Should Contact Anti-matter in Any Form, a Catastrophic Explosion Will Result.

From Absolute Zero Gravity, by Devine & Cohen

experts we become when defending our favorite Nagler...

While the debate on Naglers and eyepieces in general continues to rage, I think we can come to an amicable agreement along one front at least. And that concerns the advisability of using expensive Nagler eyepieces for public star parties where any kind of citizen may look through them. It doesn't take the amateur long to realize that putting Naglers into the focuser for public consumption is courting tragedy. Among the worst offenders are those kids who feel they must reach up and touch the eyepiece before placing their eye for viewing. Of course, they must touch not just the edges of the eyepiece, but the very glass itself! Cleaning fingerprints off of Naglers after a public star party is conducive to sleepwalking and nightmares. Next in line of offense are those gentle members of the opposite sex who, in a misguided effort to

“Go ahead Junior.

Look at the pretty planet.”

appear well-groomed to the dark-adapted public, use copious quantities of mascara on their eyelashes. The fact that they are leaving large percentages of this substance upon eyepiece eye lenses seems to totally escape them. Here's to womanhood! Here's to a ban on mascara!

Finally, I feel I must relate my last experience with problems of this stripe. A couple of students in our previous mirror making class were school teachers living and working in Charleston, South Carolina. Each and every week they drove three and one half hours each way in order to build and complete six inch $f/5$ reflecting telescopes (both telescopes were exquisite, with remarkably tiny star images.) In a sort of reciprocal arrangement, my wife Fannie and I agreed to drive to Charleston and present a one day series of slide programs and workshops on astronomy to each of their respective classes. Afterwards, we were to go to the naval munitions station and set up telescopes for an observing session with several members of the Charleston astronomy club. One hundred and fifty students and parents were invited to join us for this star party and indeed, nearly that many showed up.

However, as we were setting up, the usual Carolina Nebula (clouds) made its appearance. We sat around, waiting for the clouds to dissipate and taking visual shots of Jupiter and the first quarter moon whenever holes would appear. During these observing efforts I was using my prized 20mm Nagler eyepiece in my twenty inch telescope. When the sky cleared and the crowd surged

forward, I forgot to replace my Nagler with a cheaper, more “dispensable” eyepiece. For in short order I had people climbing up to the eyepiece and enjoying views of Jupiter that brought forth exclamations of delight and wonder. Ah, what joy! How marvelous to be instrumental in bringing the universe to these deserving members of the public! My public and civic spirit was running high and adrenaline was flowing unimpeded as I watched these people sampling the smorgasbord of celestial delight I so readily take for granted. Until...

A proud father approached with an eighteen month old son in his arms. Anxious to demonstrate to the son his astronomical dexterity, the father raised the child to the eyepiece and said, “Go ahead Junior. Look at the pretty planet.” At that point, Junior reached up and placed both hands around the Nagler, apparently preparing to look into the eyepiece. I simply couldn't help doing a little preening and tried to appear benevolently wise and thoughtful. “Oh me,” I mused, as the child drew toward the eyepiece, “I may have here the opportunity of showing the universe to, and of helping to inspire a future Carl Sagan or Stephen Hawking. What a feeling of importance and history I modestly feel at this point.” By my reverie was quickly cut short; that foolish kid wasn't looking in the eyepiece at all... **HE WAS KISSING IT! FULL ON THE LENSE! THIS LITTLE, USELESS RASCAL ACTUALLY FRENCH KISSED MY NAGLER! OH NO!!! NOT MY NAGLER!!!**

Well, I'm tough. After almost knocking the pair off the ladder, I climbed up and was rewarded with a view of my Nagler soaking wet. Have you ever experienced Jupiter through an expensive eyepiece and a freshly deposited layer of split? And just how tough am I? Well sir, I reached into my pocket, withdrew my handkerchief and calmly (sic) wiped from the Nagler's desecrated surface the offending moisture. Gently patting the side of the molested eyepiece, I turned to the crowd of aspiring observers and quietly said, “Next?” I won't even get into what happened to the adrenaline flowing so freely...

Newsletter Deadline

Mail items at least two weeks before the end of the month. Items arriving too late for an issue will be included in the next newsletter.

The Great Moon Race: The Tide Turns

by Andrew J. LePage

Part 2

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This article from the August, 1993 (Volume 5, Number 1) issue of the Electronic Journal of the Astronomical Society of the Atlantic (EJASA) of the Astronomical Society of the Atlantic (ASA).

More Missions

On November 6, 1966, just twelve days after LUNA 12 slipped into lunar orbit, the Americans launched LUNAR ORBITER 2 towards the Moon. Its mission was to photograph thirteen primary and seventeen secondary

sites located in the southern part of the near side equatorial region.

Several modifications were made to LUNAR ORBITER 2 as a result of problems with the previous mission. The camera system's shutter trigger circuits were modified to make them less susceptible to noise. To prevent the problem of stray reflections, which wreaked havoc with the Canopus star sensor, the end of the low-gain antenna as well as the edges and backs of the four solar panels were coated with anti-reflective black paint. To overcome thermal problems resulting from paint degradation, a new paint was applied to the Sunward side of the equipment deck. In addition, three metal coupons coated with other paints and an instrumented mirror were carried to evaluate their usefulness in case the new paint also did not perform as well as required.

After making a 51-mile per hour (23-meter per second) course correction on November 8, LUNAR ORBITER 2 successfully entered a 122 by 1,163-mile (196 by 1,871-kilometer) lunar orbit inclined 12.2 degrees on November 10. Another burn five days later lowered the periapsis to 31.4 miles (50.5 kilometers), so that the actual mapping mission could begin on November 18. After one solid week of mapping involving 205 attitude changes, the mapping mission was completed and the transmission

Comet Comments

by Don Machholz

(916) 346-8963

October 7, 1993

Comet Mueller 1993a and Comet Mueller 1993p remain visible in our sky this month. They are joined by Periodic Comet Schwassmann-Wachmann 2. It will be closest to the sun on Jan. 23 at 2.07 AU. Comet "SW2" will brighten to only about magnitude 11 on this visit.

Comet	Mueller		(1993p)		
Date	RA-2000-Dec	Elong	Sky	Mag	
10-20	23h55.5m	+39°08'	143°	E	11.6
10-25	23h44.8m	+36°23'	141°	E	11.5
10-30	23h35.0m	+33°22'	138°	E	11.3
11-04	23h26.3m	+30°09'	134°	E	11.2
11-09	23h18.7m	+26°49'	130°	E	11.1
11-14	23h06.9m	+21°14'	121°	E	11.1
11-19	23h01.6m	+17°38'	115°	E	11.0
11-24	22h57.4m	+14°09'	108°	E	10.9
11-29	22h54.4m	+10°49'	101°	E	10.8
12-04	22h52.4m	+07°41'	95°	E	10.7
12-09	22h51.3m	+04°45'	89°	E	10.6
12-14	22h51.0m	+02°01'	83°	E	10.5

Comet	Mueller		(1993a)		
Date	RA-2000-Dec	Elong	Sky	Mag	
10-20	15h28.5m	+82°32'	93°	E	9.3
10-25	17h19.4m	+80°13'	96°	E	9.2
10-30	18h25.9m	+76°25'	97°	E	9.1
11-04	19h06.2m	+71°51'	98°	E	9.0
11-09	19h33.1m	+66°52'	98°	E	8.9
11-14	19h52.8m	+61°41'	97°	E	8.8
11-19	20h08.2m	+56°29'	95°	E	8.8
11-24	20h20.9m	+51°23'	92°	E	8.8
11-29	20h31.8m	+46°30'	89°	E	8.8
12-04	20h41.5m	+41°54'	85°	E	8.8
12-09	20h50.2m	+37°39'	81°	E	8.9
12-14	20h58.3m	+33°46'	76°	E	8.9

Periodic Comet Schwassmann-Wachmann 2					
Date	RA-2000-Dec	Elong	Sky	Mag	
10-20	07h47.7m	+18°29'	91°	M	12.4
10-25	07h55.1m	+18°10'	94°	M	12.3
10-30	08h02.1m	+17°52'	98°	M	12.2
11-04	08h08.8m	+17°35'	101°	M	12.1
11-09	08h15.0m	+17°18'	105°	M	12.0
11-14	08h20.7m	+17°03'	108°	M	11.9
11-19	08h25.8m	+16°49'	112°	M	11.8
11-24	08h30.4m	+16°37'	116°	M	11.7
11-29	08h34.3m	+16°28'	120°	M	11.6
12-04	08h37.5m	+16°22'	124°	M	11.5
12-09	08h40.1m	+16°20'	129°	M	11.4
12-14	08h41.8m	+16°21'	134°	M	11.4

Summary of Lunar Probe Launches, Second to Fourth Quarter 1966

Name	Launch Date	Country	Weight lbs (kg)	Launch Vehicle	Comments
SURVEYOR 1	May 30, 1966	US	2191 (995)	ATLAS-CENTAUR	Lunar landing
EXPLORER 33	Jul 1, 1966	US	205.7 (93.4)	DELTA E	Unsuccessful lunar orbiter attempt
LUNAR ORBITER 1	Aug 10, 1966	US	852 (387)	ATLAS-AGENA D	Photographic lunar orbiter
LUNA 11	Aug 24, 1966	USSR	3611 (1640)	MOLNIYA	Lunar orbiter
SURVEYOR 2	Sep 20, 1966	US	2204 (1001)	ATLAS-CENTAUR	Unsuccessful lunar landing
LUNA 12	Oct 22, 1966	USSR	3567 (1620)	MOLNIYA	Photographic lunar orbiter
LUNAR ORBITER 2	Nov 6, 1966	US	859 (390)	ATLAS-CENTAUR	Photographic lunar orbiter
LUNA 13	Dec 21, 1966	USSR	3567 (1620)	MOLNIYA	Lunar lander

of images began. A failure in high-gain transmitter on December 6 resulted in the loss of the last two high resolution and the last three medium resolution images showing APOLLO Site 1.

Despite this minor loss, this mission did take the most memorable image of the whole series. Even if there was no target of interest to photograph, the film in the photographic system had to be advanced every four to eight hours so that it would not stick to the Bimat webbing. These opportunities were usually used to take images of the lunar farside or additional views of the front. For one of these photographs, LUNAR ORBITER 2 took an oblique image across the crater Copernicus from an altitude of 28.5 miles (45.9 kilometers). For the first time, the Moon was seen by the public as a three-dimensional place with rugged mountains and smooth plains. At the time newspapers dubbed the photograph "The Picture of the Century". In addition to this and other photographs, the LUNAR ORBITER 2 meteoroid detector recorded only three hits, indicating that the micrometeoroid threat was virtually non-existent in lunar orbit.

On December 8, with its mapping mission complete, LUNAR ORBITER 2 fired its engine again for 62 seconds to increase its inclination to 17.5 degrees. This allowed the orbiter to fly over a larger latitude range in order to study lunar mascons and provide tracking experience. Another three-second burn on April 14, 1967 shortened the orbital period by 65 seconds, reducing the time the spacecraft would spend in darkness during the lunar eclipse ten days later. A final burn on October 11, 1967 chopped 160 miles per hour (71 meters per second) off of LUNAR ORBITER's velocity, allowing it to crash at 4 degrees south, 98 degrees east. So ended a second successful mapping mission.

Last Call

As the year 1966 was drawing to a close, the Soviets left no doubt who started this banner year for lunar exploration. On December 21, LUNA 13 was launched first into a 106 by 145-mile (171 by 233-kilometer) Earth parking orbit and then on towards the Moon. Unlike the previous three acknowledged Soviet missions which went into lunar orbit, LUNA 13 was headed for another lunar landing. After a course correction the day after launch,

LUNA 13 made its final approach and landed on Christmas Eve, only 250 miles (400 kilometers) from LUNA 9 at 18.57 degrees north, 60.00 degrees west.

The 240-pound (109-kilogram) LUNA 13 lander was very similar to its sister, LUNA 9, but carried several additional experiments to study the properties of the Moon. Inside the spherical lander was carried a three-axis accelerometer to record the landing forces. This information would allow studies of the surface structure to a depth of eight to twelve inches (twenty to thirty centimeters) below the surface.

Two five-foot (1.5-meter) long booms were also deployed upon landing. One boom carried a penetrometer consisting of a titanium-pointed, two-inch (five-centimeter) long, 1.4-inch (3.5-centimeter) wide rod. A small explosive charge applied sixteen pounds (seventy newtons) of force to this rod for 0.6 to 1.0 seconds, pushing it into the dusty surface five minutes after landing. The rod penetrated 1.8 inches (4.5 centimeters) into the lunar soil, indicating that it was a granular mixture with a density of 0.8 grams per cubic centimeter.

The second boom contained a radiation densitometer using a cesium-137 gamma-ray source and three detectors. By the way the gamma rays were scattered, the density of the soil could be determined. This experiment confirmed the results of the penetrometer to a depth of six inches (fifteen centimeters). Four radiometers were also mounted around the capsule's circumference. They indicated that the surface temperature was about 243 degrees Fahrenheit (117 degrees Celsius). A radiation detector mounted next to the panoramic camera measured the surface radiation environment. It showed that one-quarter of the cosmic radiation hitting the Moon is reflected from the surface.

A total of five images were returned by the 3.7-pound (1.7-kilogram) camera during the mission. Because of the location of the new radiation detector, the camera could now only scan through 220 degrees of azimuth. Still, the images showed that LUNA 13 came to rest at a sixteen-degree angle in a featureless plain with only a few stones poking through the soil. Surface operations continued until the batteries were finally depleted of energy on December 30.

Unknown to those in the West, this would be the last

second generation LUNA landing mission. It was also a fitting end to the busiest year to date in lunar exploration. The following year, 1967, would prove to be even busier with already planned American missions.

However, budget constraints caused by the ever-increasing needs of the APOLLO project (not to mention the conflicts in Southeast Asia and domestic social programs) had effectively killed any future plans for unmanned lunar exploration by the United States.

On December 13, 1966, NASA canceled all plans for additional, more heavily instrumented SURVEYOR flights after the seventh mission. This decision just added to the scramble to include whatever advanced experiments possible on the five remaining SURVEYOR flights. Plans for a gamma-ray spectrometer-equipped LUNAR ORBITER were also scuttled. After 1967, American scientist would have to rely on the highly political, engineering oriented APOLLO missions for new information on the Moon. For now, though, there was still 1967.

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About the Author

Andrew J. LePage is a scientist at a small R&D company in the Boston, Massachusetts area involved in space science image and data analysis. He has written many articles on the history of spaceflight and astronomy over the past few years that have been published in many magazines throughout North America and Europe. Andrew has been a serious observer of the Soviet/CIS space program for over one dozen years. Andrew’s Internet address is: lepage@bur.visidyne.com.

Bits and Pieces

Coming Events

Officer elections are upon us. The Christmas Party will be in December.

Deep Sky Meeting

The Deep Sky Group is made up of people that like to observe celestial bodies out past the far reaches of our Solar System. These bodies include stars, nebula and galaxies. If you are interested in sharing your observations, or knowing what they look like in telescopes — then by all means come join us at the next meeting. We will discuss Deep Sky objects in Pisces. The meeting will be held at John McGrath’s house; directions are here in the newsletter.

You don’t need to RSVP, we don’t extend special invitations to anyone — ourselves included. If you are interested show up, we’d love to have you.

SAC and SAC Meetings

Saguaro Astronomy Club (SAC) was formed in 1977 to promote fellowship and the exchange of scientific information among its members — amateur astronomers. SAC meets monthly for both general meetings and star parties, and regularly conducts and supports public programs on astronomy.

SAC meetings are usually held on the Friday nearest the full moon. This means that over the course of the year, meetings are not held on same week of the month. The same is true of the club’s star parties. Star parties at Buckeye Hills are mostly held on the Saturday of the third quarter moon.

1993 SAC Meetings

- Oct. 29
- Nov. 19
- Dec. 18 Party
- 1994 —
- Jan. 28
- Feb. 25
- Mar. 25
- Apr. 22
- May 27
- Jun. 24
- Jul. 22
- Aug. 19
- Sep. 16

1993 SAC Star Parties

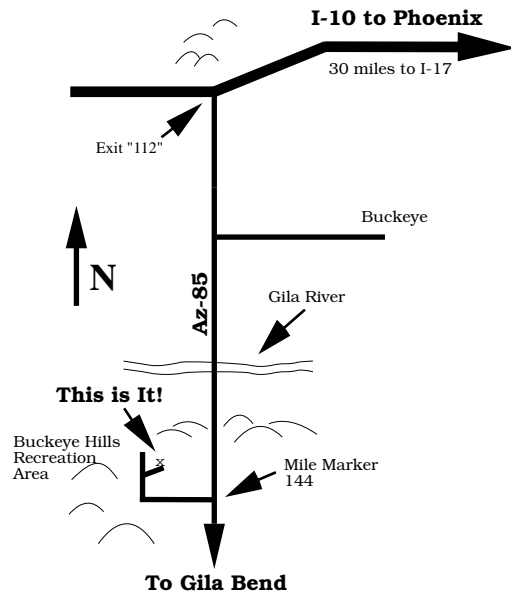
Date	Sunset	Moonrise
Oct. 9	6:03pm	1:04am
Nov. 6	5:33pm	11:57pm
Dec. 11	5:22pm	6:35am
— 1994 —		
Jan. 8	5:38pm	5:22am
Feb. 5	6:05pm	4:11am
Mar. 5	6:29pm	2:58am
Apr. 9	6:55pm	5:42am
May 7	7:16pm	4:17am
Jun. 4	7:34pm	2:52am
Jul. 2	7:42pm	1:27am
Aug. 6	7:24pm	6:09am
Sep. 3	6:51pm	4:56am

The Deep Sky meeting will take place on Thursday, November 4 at 7:30pm.

Directions to SAC Events

SAC General Meetings 7:30 PM at Grand Canyon University, Fleming Building, Room 105 — 1 mile west of Interstate 17 on Camelback Rd., north on 33rd Ave., second building on the right.

SAC Star Parties at Buckeye Hills Recreation Area



Interstate 10 west to Exit 112 (30 miles west of Interstate 17), then south for 10.5 miles, right at entrance to recreation area, one-half mile, on the right. No water and only pit toilets. Please arrive before sunset; allow one hour from central Phoenix.

SAC Deep Sky Subgroup Meeting at John & Tom McGrath's, 11239 N. 75th St., Scottsdale, 998-4661 — Scottsdale Rd. north, Cholla St. east to 75th St., southeast corner.

Minutes of the September Meeting

President Bob Dahl opened the September meeting of SAC with a welcome to all new members and visitors. Piet Burggraaf mentioned that the regular Public Star Party hosted by the Glendale Recreation Center is scheduled for Oct. 23, at Thunderbird Park in Glendale. Our own club party will be at Buckeye Hills on Oct. 9 and the All-Arizona Star Party will be at EVAC's Arizona City site on Oct. 15-16. The Orionid Meteor Shower is expected to be visible that and the following weekend. The next regular meeting of SAC will be October 29. Bob reminded everyone of the club's officer nominations for next month. A Public Events coordinator is needed.

A few months ago, A.J. Crayon mentioned that we needed a new program for members beyond the current observation lists, such as the Messier, Herschel 400, etc.

There is now an Observation 1000+ of Deep Sky Objects never seen before, and next month an award will be presented. The Deep Sky group will meet on November 4 and the Constellation studied will be Pisces. A.J. reminded members for Steve Coe that the SAC database of 10,000 objects is still available at the table, in DOS format. Paul Dickson said that at the Tucson group meeting, Dean Ketselsen said the mold for the second 6 1/2 meter mirror is near ready to be cast. A casting party has a sign-up sheet for members wishing to attend. Call Paul for more information.

Following break, for "Show'n'Tell", Steve Strazdus showed charts of something in Sagittarius at 9th magnitude — possibly a nova — check with him for more information. Tom Polakis reviewed the Lowell Trip and talked about the problem of getting good speakers. Paul Lind had a video presentation of his spinning techniques for grinding his telescope mirror. Pierre Schwaar showed a video of various sunsets and sunrises, new moons, lunar observations, and the Lowell trip.

The main speaker was Steve Coe, whose topic was "Humanity Discovers Island Universes."

Respectfully submitted from notes taken by Carol Lee. — Susan V. Morse, SAC Secretary

Letters

This letter arrived mid-October from Germany.

Dear Mr. Dickson,

By file transfer from chara.gsu.edu (Georgia State University) I lately came across your SACNEWS, and I would like to make a comment on your title logo.

If the words "Videmus stellae" are intended to be Latin with the meaning "We see (the) stars," then they contain the following error: since "(the) stars" is a direct object, it should become "stellas" (accusative case) in Latin, not "stellae" which is nominative case.

With regards, (signed) Reinhard Philipp.

Dr. Philipp,

Thank you for pointing this out. If it's correct, then it will take more than just my changing of the logo. The club's motto has been "Videmus stellae" since the first month the club existed — nearly 17 years now. The club's motto is defined by the club's constitution, and changing that will take a vote by the club's membership.

Paul Dickson, SACNEWS Editor

November 1993

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			EVAC Meeting Directions: Joe Murray 482-2918	SAC Deep Sky Meeting	Tomorrow Last Quarter Moon 11:36 p.m.	SAC Star Party Buckeye Hills (members & guests)
	1	2	3	4	5	6
	Venus 0.4°N of Jupiter 10 a.m.				Jupiter 4°N of Moon 7 a.m. Venus 4°N of Moon 2 p.m.	New Moon 2:34 p.m.
7	8	9	10	11	12	13
					SAC Meeting	First Quarter Moon 7:03 p.m.
14	15	16	17	18	19	20
				Thanksgiving Day		
21	22	23	24	25	26	27
Full Moon Total Eclipse 11:31 p.m.			<div style="border: 1px solid black; padding: 5px; display: inline-block;"> All Times are Mountain Standard Time </div>			
28	29	30				

Magazines & Discounts

Club members may subscribe to astronomical magazines at reduced rates through the club Treasurer. See the Member Services Form on the back page of this newsletter. Furthermore, club members are encouraged to align their subscriptions with the Jan.-Dec. calendar year. This eases the burden both on the Treasurer and the Publisher by permitting a single Group Renewal to be placed in the autumn for the upcoming calendar year.

Those members who experience problems with their subscriptions to *Astronomy* magazine may call Kalmbach Publishing Customer Service at (800) 446-5489.

Those members who experience problems with their subscriptions to *Sky & Telescope* magazine may call Sky

Publishing at (800) 253-0245.

Besides the club discount on *Sky & Telescope* magazine, Sky Publishing offers club members a 10% discount on all other Sky publications. This means books, star atlases, observing aids, Spotlight prints, videos, globes, computer software, and more.

Club members who subscribe to *Sky & Telescope* through the Club Discount Plan may order Sky publications directly, at the above toll-free number, without going through the club Treasurer. Simply mention the Club Discount Plan and give the Saguaro Astronomy Club name to receive the discount. Sky Publishing will check their records to verify that you are eligible to receive the discount.

Saguaro Astronomy Club Member Services Form

Membership

Memberships are for the calendar year and are pro-rated as follows: Jan - Mar 100%, Apr - Jun 75%, Jul - Sep 50%, Oct - Dec 25%.

- \$20.....Individual Membership
- \$30.....Family Membership (one newsletter)
- \$100.....Business Membership (includes advertising)
- \$4.....Nametag for members
- \$10.....Newsletter Only

Subscriptions

The following magazines are available to members. Subscribe or renew by paying the club treasurer. You will receive the discounted club rate only by allowing the treasurer to renew your subscription.

- Sky & Telescope.....\$20.00 for one year
- Astronomy.....\$16.00 for one year

Write your name, address, and phone number in the space below.

Make checks payable to SAC.
Mail the completed form to:
Carol Lee
SAC Treasurer
3314 N 68th Street, #205-W
Scottsdale AZ 85251



SACNEWS

c/o Paul Dickson
7714 N 36th Avenue
Phoenix AZ 85051

Stamp

First Class Mail