

# Saguaro Astronomy Club

Metro Phoenix, Arizona

## SACNEWS



July 1997 — Issue #246

v6.23

## Getting Started Astrophotography for Everyone by Wil Milan Part II

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In the last article we discussed the equipment you need to do the simplest types of astrophotography: with a fixed camera and with an unguided piggyback camera. In this article we'll discuss the how-to of each of these.

### Fixed-camera astrophotography

Fixed-camera astrophotography is simplicity itself: Mount the camera on a tripod and snap away. Well, OK, "snap" is not quite correct, but there's really not much more to it than that.

The simplest, and in many ways most satisfying, type of fixed-camera astrophotography is recording images of constellations and the Milky Way. With fast film and a fast lens you can take photos which will reveal more than your eye can see and, if you use color film, will record subtleties of star colors the human eye cannot detect.

The thing that complicates fixed-camera astrophotography is that the Earth is rotating, and therefore the stars appear to be continually moving across the sky. (I hope this is not news to you.) Fixed-camera astrophotos therefore fall into one of two categories:

1. If the exposure is more than a few seconds, the motion of the stars will be visible and the stars will look like curved streaks across the image. These are known as "star trails." Star-trails can make very striking and attractive photos, but it can be very difficult to discern exactly what one is seeing. Constellations don't look like constellations when all the stars look like curved lines.
2. The other way to do fixed-camera photography is to keep the exposure very short. If the exposure is kept short enough then images of constellations and the brighter portions of the Milky Way will appear much as they do in the

### Quick Calendar

SAC Meeting  
7:30 PM, Friday, July 18

SAC Deep-Sky Meeting  
7:30 PM, Thursday, July 24

SAC Star Party  
Buckeye Hills Recreation Area  
Saturday, July 26

sky, though typically revealing more stars and detail than the eye can see. But the exposure has to be kept short enough that the motion of the stars is not evident in the film image.

### Lenses to use

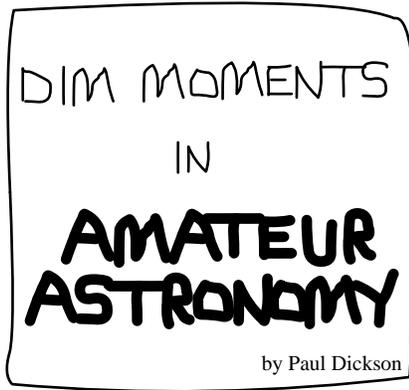
How short does an exposure have to be to avoid star trails? That depends on the focal length of the lens. The longer the focal length of the lens on the camera, the more it magnifies the sky, and therefore the more it magnifies the sky's apparent motion. With a standard lens (i.e., a 50mm lens on a 35mm camera) exposures up to 12 seconds or so will not show any trailing. With a 2x lens (i.e., a 100mm lens on a 35mm camera), stars may trail after only 6 seconds. With a 4x (200mm) lens, star images may trail after only 3 seconds.

What this means is that you should do the opposite of what most people would think. It may seem obvious to

### SAC Officers

Area Code (602)

President	Adam Sunshine	780-1386 asunshine@netzone.com
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Public Events	Rich Walker	997-0711
Deep-Sky Group	A.J. Crayon	938-3277 acrayon@primenet.com
SACNEWS Editor	Paul Dickson	862-4678 FAX: 841-0509 dickson@primenet.com



use the longest telephoto lens you have to photograph the sky, but for fixed-camera photography the best lenses are normal and wide-angle lenses because they allow longer exposures without trailing. Also, normal and wide-angle lenses tend to have “faster” (i.e., numerically lower) focal ratios, which means they will capture more star images in a given time than “slower” telephoto lenses. (See sidebar for an explanation of what “fast” and “slow” lenses are.)

### Use fast film

To photograph constellations or the Milky Way we'll also need fast film. The speed champion among color films is Konica SR-V 3200, a 3200-speed print film which can capture amazing sky images in only a few seconds. Konica 3200 film can be a bit difficult to find in department stores, but it's commonly available in camera stores. If you can't find Konica 3200 film, both Kodak and

Fuji make 1000- and 1600-speed films for both prints and slides. For this kind of photography I don't recommend you use film slower than 1000 speed, and the super-fast 3200-speed Konica film really works best.

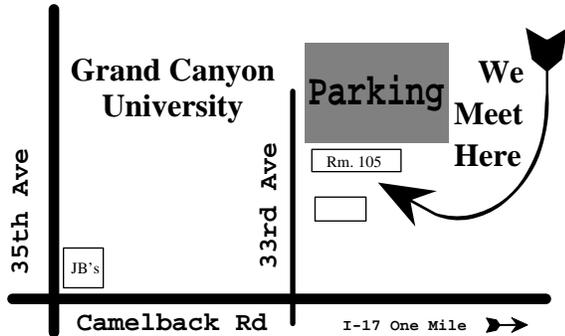
What about black-and-white film? Yes, you can use black-and-white film, and Kodak does make a 3200-speed black-and-white film (TMAX 3200) which will work as well as Konica SR-V 3200. But black-and-white film will not capture the subtle colors of stars and nebulae, and as long as you're going to go through the effort, why not capture the best image possible?

### Taking a photo

Once the selected lens is in place and the camera is loaded with fast film, attach the camera to a tripod and the cable release to the camera. Remove the lens cap if you've not already done so and set the camera to

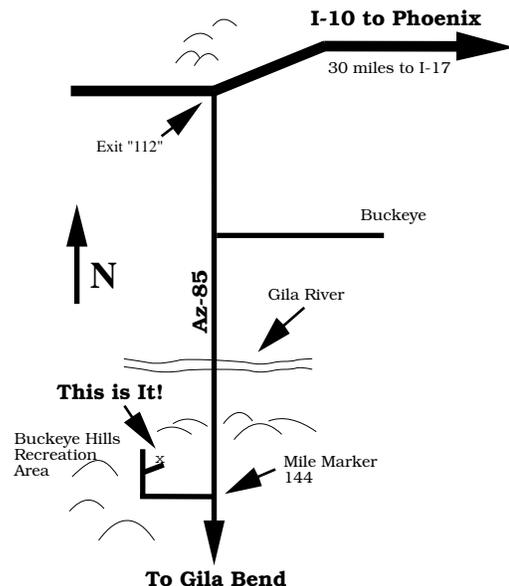
## Directions to SAC Events

**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 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.

**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.



the shutter setting for taking long exposures (usually the “B” or “T” setting). Focus the lens on infinity, then aim the camera at the constellation or area of the sky you’d like to photograph. It’s best to select an area of the sky well above the horizon, not only to take advantage of the greater atmospheric clarity higher in the sky but to avoid the skyglow which often plagues the horizon.

Once everything is ready, use the cable release to open the shutter and hold it open for the desired length of time. Use the table below to select the amount of time to leave the shutter open (all times in seconds):

Focal length of lens:	24mm	50mm	100mm	200mm
Sky areas...				
near the celestial equator:	26	12	6	3
approximately halfway to poles:	42	20	10	5
near the celestial poles:	92	50	25	12

Note the advantage of shorter lenses and of shooting near the poles: they make much longer exposures possible and therefore make it possible to capture much more light on film. For that reason I recommend you start out with images of the Big Dipper and Cassiopeia, constellations which are near the poles, are easily recognizable in photos, and are full of interesting detail. But feel free to experiment, including taking photos of the central Milky

Way, which can provide some of the most spectacular images possible without guiding.

### Unguided piggyback photos

If you have an equatorial mount, you can extend the fixed-camera procedure to take longer photos. Instead of attaching the camera to a fixed tripod, attach the camera to the telescope or telescope mount. (Special brackets are available for this from telescope makers and aftermarket manufacturers.)

Start by precisely aligning your equatorial mount to the celestial pole. Your telescope’s manual should include a procedure for doing this. (If not then consult a book on the matter—see below for some recommendations—or wait for an upcoming article which will discuss this.) The more precise the polar alignment the better your results will be, so it pays to take the time to do it right.

Once the mount is aligned and the camera attached atop the telescope, aim the scope and camera to the part of the sky you’d like to photograph and engage the clock drive. Once the clock drive is fully engaged and driving properly, open the shutter and take the exposure as with a fixed-camera photograph. The only difference is that with the equatorial mount tracking the sky the exposures

## Comet Comments

by Don Machholz

(916) 346-8963    CC227.TXT    June 10, 1997  
 DonM353259@aol.com

1995 O1 (Hale-Bopp)					
Date	RA-2000-Dec	Elong	Sky	Mag	
06-26	06h34.0m	+00°14'	23°	E	3.4
07-01	06h41.3m	-01°37'	25°	M	3.6
07-06	06h54.6m	-03°27'	26°	M	3.8
07-11	06h54.6m	-05°16'	28°	M	3.9
07-16	07h01.0m	-07°05'	30°	M	4.1
07-21	07h07.1m	-08°55'	32°	M	4.3
07-26	07h13.0m	-10°45'	35°	M	4.4
07-31	07h18.8m	-12°36'	37°	M	4.6
08-05	07h24.3m	-14°28'	39°	M	4.7
08-10	07h29.6m	-16°21'	42°	M	4.9

**Comet Hale-Bopp** and **Periodic Comet Encke** are not far apart in early June in the southern sky. They remain visible mainly to those in the equatorial areas and south of the equator.

As observers turned their instruments to observe **Comet C/1997 J1 (Mueller)**, they also picked up a new comet-unrelated- but slightly brighter. It is now known as **Comet C/1997 J2 (Meunier-Dupouy)**. This large comet will be closest to the sun next March at 3.05 AU when it should reach magnitude 10.

Meanwhile, a solar-orbiting satellite named SOHO has picked up ten new faint comets over the past year. All were imaged only by the satellite as they zoomed in toward the sun. Most seem to be following the same orbit

as the Kreutz Sungrazing comets, disappearing as they rounded the sun. They were magnitude 2 to 8, with most at mag. 7-8.

COMET HUNTING NOTES: Of the 97 visual comet discovery events since 1/1/75—during which 73 comets were found and named—only four times was the comet found by accident. In early July 1975 Doug Berger and the late Dennis Milon found a comet while observing M2. It had been found the previous day by a comet hunter (Toru Kobayashi of Japan). Then, twenty years later Alan Hale and Thomas Bopp chanced upon a new comet near M70.

P/Encke					
Date	RA-2000-Dec	Elong	Sky	Mag	
06-26	07h09.0m	-17°27'	43°	E	6.1
07-01	07h48.7m	-36°06'	61°	E	6.0
07-06	09h22.3m	-57°51'	86°	E	6.3
07-11	12h46.0m	-67°39'	107°	E	6.9
07-16	15h18.5m	-61°58'	120°	E	7.7
07-21	16h20.2m	-54°40'	126°	E	8.5
07-26	16h50.5m	-49°07'	129°	E	9.2
07-31	17h09.0m	-45°02'	129°	E	9.8
08-05	17h22.2m	-41°58'	127°	E	10.4
08-10	17h32.6m	-39°36'	125°	E	10.9

### Orbital Elements

Object:	Hale-Bopp	P/Encke
Peri Date:	1997 04 01.13800	1997 05 23.59776
Peri Dist:	0.9141405 AU	0.3313951 AU
Arg/Peri (2000)	130.58915°	186.27201°
Asc Node (2000)	282.47069°	334.72147°
Incl (2000):	089.42943°	011.92956°
Eccentricity:	0.9951172	0.8500135
Orbital Period:	~2500 years	3.28 years
Reference:	MPC 29568	MPC 29882
Epoch:	1997 06 01	1997 06 01
Absol Mag/“n”:	-1.0/4.0	9.8/4.0

## “Fast” and “Slow” Lenses

In photography, the “speed” of a lens is determined by its focal ratio, which is the focal length of the lens divided by its aperture. A lens with a 50mm focal length and a 25mm aperture would therefore have a focal ratio of 2, usually stated as  $f/2$ . Fortunately you don’t usually have to compute the focal ratio of a lens because it is generally stamped either on the front ring or the lens body.

The reason the focal ratio is important is that the lower the focal ratio, the faster the lens will acquire images on film. What an  $f/4$  lens will capture in 10 seconds an  $f/2.8$  lens will capture in 5 seconds and an  $f/2$  lens will capture in less than 3 seconds. Conversely, for a given length of exposure an  $f/2$  lens will capture more stars and nebulae than an  $f/2.8$  lens, which in turn will capture more than an  $f/4$  lens. In photo parlance, a lens with a low focal ratio is considered a “fast” lens while one with a higher focal ratio is considered a “slow” lens.

For most cameras the fastest lens is the standard lens (usually a 50mm lens or so), which is why such lenses generally work so well for short-exposure astrophotos. Telephoto lenses, while they provide more magnified images, are generally “slower” than standard lenses. Their slower speed combined with their greater magnification of sky motion means telephoto lenses are more suited to guided astrophotography where precise guiding allows longer exposures.

you can take will be substantially longer.

How much longer? That depends on the accuracy of your polar alignment and your clock drive. A well-aligned mount with a very accurate clock drive will allow unguided piggyback photos many minutes in length, particularly if the camera lens used is under 200mm focal length. If the polar alignment is off or the clock drive is inaccurate you may find that images start to trail in less than a minute.

How can you tell how accurately your clock drive and mount are tracking? A quick check is to insert a high-power eyepiece in the main scope and see if stars drift within the field of view. If you’re using a 50mm lens on the piggyback camera, use at least 25x in the main scope to check for drift; if you’re using a 200mm lens, use at least 100x. If you see no discernible drift in the eyepiece during the duration of the exposure, there will be no trailing in the photograph. An eyepiece with crosshairs will make it much easier to detect any drift. If you don’t have a crosshair eyepiece, don’t check for drift by looking at a star in the center of the field of view; instead check the edges of the field and see if stars are moving relative to the edge.

However you check for drift, test how long your scope will track without drifting and adjust your exposure time accordingly. Even if your scope has some drift, chances

are it will still allow you to take much longer exposures than with a fixed camera, and therefore you will be able to capture much more sky detail.

Of course, if your scope has a means to make guiding adjustments, then it’s easy to keep correcting the drift as it occurs. This is what guided piggyback photography is, and it’s really not hard to do at all. But this article is about unguided astrophotography, and there’s a lot you can do without doing any guiding at all.

### Recommended reading

There are many good books on astrophotography, but a couple I can recommend are:

“Astrophotography for the Amateur” by Michael A. Covington. An excellent guide to all types of astrophotography, from the simplest to the most complex.

“The Backyard Astronomer’s Guide” by Terence Dickinson and Alan Dyer. A superb introduction to every aspect of amateur astronomy, including a thorough introduction to astrophotography.

## Newsletter Deadline

Mail items for Such-a-Deal at least two weeks before the end of the month. Articles that need to be published in a timely fashion must be submitted or the newsletter editor notified of the article at least 6 weeks before month they are published. Items arriving too late for an issue will be included in the next newsletter.

## Bits and Pieces

### Minutes from the May Meeting

The May meeting was called to order by Adam Sunshine at 7:30. Adam asked for the visitors to sign the guest book and to introduce themselves. We had 5 guests say hello.

Regina Lawless gave the treasurers report.

A.J. Crayon talked about the 20th Anniversary dinner at Bud Browns Barn. The club still has the anniversary T-shirts for \$12 each. A.J. and Steve Coe have planned a novice meeting on June 12, 7:30 to 10:00 pm at Steve’s house. The Deep Sky meeting will be on May 22 at the McGrath’s house. The constellation will be Leo Minor and any pictures that you want to bring. A.J. presented Ken Reeves his plaque for the Messier Award.

Paul Dickson talked about the different books that are for sale.

Adam discussed the May 10th Public “Cloud” Party at Thunderbird Park. Oh, well!

Al Gore talked about his nifty little database that he calls SACFind. He used the SAC database and put together a program to use the database.

We had some slides for Show and Tell. Rick Rotramel showed us his pictures of Comet Hale-Bopp.

After the break, we had about 35 people in attendance.

# Fuzzy Spot

by Ken Reeves

July 1997

Scorpius, Serpens, and Libra

When I took up this column, one of the constellations that I was excited about doing was Scorpius. When I looked into it, I was very surprised to find out there are only two *Herschel 400* objects and NO *SAC 110 best of the NGC* objects! There is such a variety of very nice objects, I was quite shocked. So I am going to include a few of my favorite objects in addition to the two *Herschel 400* ones. I am also going to include a couple objects from the neighboring constellations, Serpens and Libra. In fact, Libra was at one time associated with Scorpius, and some traces of this are still left in the names of the lead stars of Libra which mean the north claw and south claw (Zuben Eschamali and Zuben El Genubi respectively, I love saying those names.)

Scorpius is also special to me in that it contains the object responsible for pulling me into observational astronomy. Once I found M7 in binoculars, that was it! I still like looking at this object in binoculars, even from a light polluted sight. Another thing about Scorpius, it is fairly easy to make out the pattern of a scorpion, unlike most constellations where you need a lot of imagination (or a lot of beer) to make out the figure (a king out of a house?).

Enough rambling on, let's get on with looking at these *Herschel* objects, and some of the spectacular objects that are missing from the lists.

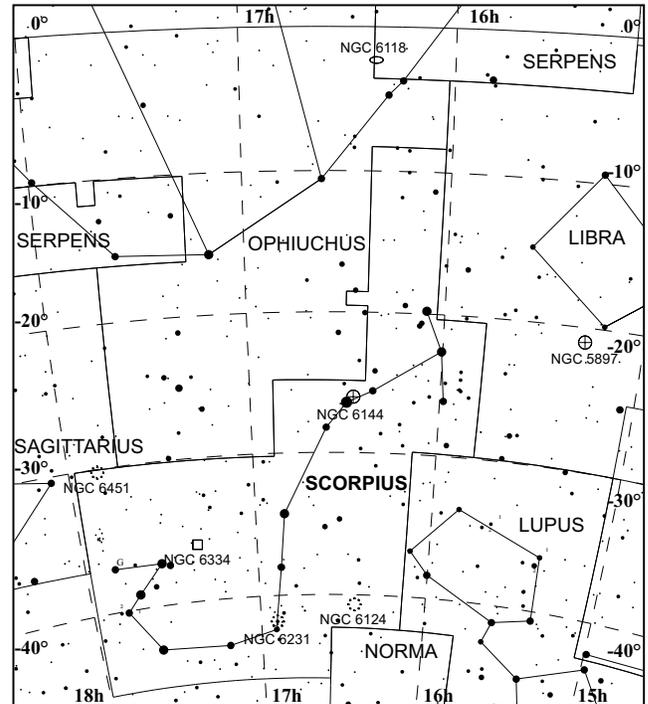
Adam introduced our speaker for tonight, Gerry Rattley and he talked about the astronomers. He had a slide set from the Astronomical Society of the Pacific called the Astronomers of the past. He showed us slides and we had to guess who they were. Interesting talk, Gerry.

The meeting adjourned and 7 people met at JB's.

—David Fredericksen, SAC Secretary

## Scorpius:

**NGC 6124** (16h25.6 -40°40') This is a real nice open cluster in the SW part of Scorpius. At 50X, it pretty much fills the entire field of view. I saw it as large, condensed toward the middle, 2 levels of stars with some nice groupings in the middle. When I observed this object, it was somewhat in the glow of Palo Verde, and I counted about 55 stars.



**NGC 6144** (16h27.3 -26°02') This globular cluster is somewhat faint and somewhat small with possible elongation E/W. There is not much concentration, mainly a granular haze with a bright star (probably a field star) on the west and no other stars resolved.

*Continued on next page...*

## Kamakaze Star Hopping by Paul Dickson

I joined a group of 6 other people for a Saturday observing session last November 9th at Sentinel. Five of the group had already spent the night before observing from the site. The evening sky was ominous. High clouds put in a strong appearance, attempting to cover the sky. But by 9 PM, the sky had cleared and the rest of the night

## Such-A-Deal

**SUCH-A-DEAL** is a place to advertise equipment, supplies, and services related to amateur astronomy. This is a free service for SAC members and friends. SAC is not responsible for the quality of advertised items or services. All insertions must be submitted in writing.

**For Sale**—Meade 8" f/6 Dobsonian reflector telescope. Almost new. Telescope includes 25mm eyepiece and Telrad finder. \$430 OBO. Paul Wilcox, 759-4147.

*Continued from previous page...*

**NGC 6231** (16h54.0  $-41^{\circ}48'$ ) and neighbors. I consider this "THE" open cluster visible from our latitude, I can only dream about what it looks like when it is high in the sky. I consider this as extremely bright, pretty big, very rich, pretty condensed, and slightly elongated E/W. There are 5 levels of stars with a star count of 40 obvious ones in the central concentration, averted vision brings out more. There is an interesting string of 4 stars in the middle that increase in magnitude as the string progresses, giving the effect of the string "sticking up" out of the cluster. I also observed this cluster on a night at Buckeye Hills that I rated 9/10 for seeing. The cluster was only about 7 degrees above the horizon. The stars were barely flickering! While in this area, be sure and check out the neighbors, **NGC 6242**, **NGC 6288**, **Harvard-12**, and nebula **IC 4628** (*Sky Atlas 2000* shows an incorrect location and size for this nebula).

**NGC 6334** (17h20.6  $-36^{\circ}04'$ ). This is a challenging nebula that has been called the Cat Paw nebula. I was unable to see it without the UHC filter, but with the filter at 70x, I saw 4 sections of very faint nebulosity surrounding stars. It is obvious how it got the name.

**NGC 6451** (17h50.7  $-30^{\circ}13'$ ) Dog gon it! I forgot

to put this open cluster on my observing list. So here is the observation from *Observe the Herschel Objects* (Ancient City Astronomy Club): "Open cluster located in Sagittarius, 6' in size. Large, few stars scattered in towards the central area, tightly grouped. Faint stars within, intermediately rich. (8-inch Refl.)" Although they call it as in Sagittarius, it is actually just in the boundary of Scorpius.

#### **Serpens:**

**NGC 6118** (16h21.9  $-02^{\circ}17'$ ) This galaxy is just S of a Mag 6 star which really interferes with the observation. I saw it as very faint, pretty small, elongated NNE/SSW with some brightening toward the middle. Keeping the star out of the field is essential for this object, averted vision doesn't help at all. I considered this as one of the hardest Herschel objects observed to date, and one of the bigger "duds."

#### **Libra:**

**NGC 5897** (15h17.4  $-21^{\circ}01'$ ) According to an early observation of mine, I saw this globular cluster as very large, faint, round, and a hint of resolution at 70X. At 110X, about 10 stars come and go over the haze.

#### **Herschel 400 Objects**

5897, 6118, 6144, 6451

was spectacular.

I call this method of hopping that I'm going to describe "Kamakaze Star Hopping" because it isn't necessarily repeatable. I discovered its usefulness at 4:30 in the morning after being awake for 46+ hours with only an hour (possibly two) of dozing on-site.

**What You Need:** You will need your telescope, and a long focal-length, wide view eyepiece. I discovered this method using only a 15mm Panoptic on my 8"  $f/4.5$  telescope. Using a longer focal length eyepiece (lower power) is recommended for less experienced observers. You will also need a very detailed star chart, such as the *Uranometria 2000* or the *Herald-Bobroff AstroAtlas*.

As I was saying, it was 4:30 in the morning and cold. I was tired and I was running out of patience. I was looking for NGC 3941, which is some distance from away bright (Telrad-able) stars. The paths for star hopping were all long and sparse. I attempted to star hop from Nu ( $\nu$ ) Ursae Majoris, but the stars on my hop trail were so far apart that I got lost along the way. I tried from other stars, but their trails were all longer.

Finally, in a last desperate attempt to find the galaxy NGC 3941, I just pointed my scope in the area it was supposed to be found. I looked through the eyepiece and noted the brightest stars. I then went to my star chart and looked for that pattern on the chart. In my case, there was a pair of bright stars in the field of view. After finding a possible match on the star chart, I noted the drift in the eyepiece due to the Earth's rotation and determined my

directions.

I now had a star pattern, its orientation, and an idea of what might lay beyond the eyepiece's field of view. Moving away from the my starting location, I confirm several "landmarks" along the way and discovered NGC 3941 within three fields of view from my starting point.

After finding NGC 3941, I did a little bit more searching to confirm that I found the correct object. Looking in the star charts, I looked at the surrounding star pattern around the galaxy. I then returned to the eyepiece to verify that those stars were indeed there, and they were.

It's probably cases like this that make a low-power (8x) finder very helpful. If I had a longer focal length telescope, I'd probably already have such a finder, but since I've managed to get away without one, I've put off purchasing one by using the method I just described.

Comet hunters do a similar procedure, only in reverse. They find the object first, then have to figure out where they are on the star chart.



Most of the group out observing at Sentinel on November 6, 1996. Photo by Paul Dickson.

# July 1997

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
All Times are Mountain Standard Time				Tomorrow New Moon 11:41 A.M.	Mars Pathfinder Land on Mars 10 AM	
		1	2	3	4	5
6	7	8	9	10	11	12
			<b>EVAC Meeting</b> (SCC: Rm. PS172)		<b>TAAA Meeting</b> (Tucson)	First Quarter Moon 2:44 P.M.
13	14	15	16	17	18	19
Sun enters Cancer 9 A.M.	Yesterday Neptune at opposition			<b>SAC Deep Sky Meeting</b> 7:30 P.M.	Tomorrow Last Quarter Moon 11:30 A.M.	<b>SAC Star Party</b> Buckeye Hills (members&guests)
20	21	22	23	24	25	26
27	28	29	30	31		
		Uranus at opposition				

## 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 prorated as follows: Jan - Mar 100%, Apr - Jun 75%, Jul - Sep 50%, Oct - Dec 25%.

- \$28.....Individual Membership
- \$42.....Family Membership (one newsletter)
- \$100.....Business Membership (includes advertising)
- \$4.....Nametag for members
- \$14.....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 club treasurer to renew your subscription.

- Sky & Telescope.....\$27.00 for one year
- Astronomy.....\$20.00 for one year

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

Make checks payable to SAC.  
Mail the completed form to:

David Fredericksen  
SAC Secretary  
6222 W Desert Hills Dr  
Glendale AZ 85304

## 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 the same week of the month. The same is true of the club's star parties. Star parties at Buckeye Hills Recreation Area are mostly held on the Saturday of the third quarter moon.

**SAC General Meetings:** 7:30 PM at Grand Canyon University, Fleming Building, room 105 — one mile west of Interstate 17 on Camelback Rd, north on 33rd Ave., second building on the right. See inside for a map to the meeting location.

### 1997 SAC Meetings

Jan. 24  
Feb. 21  
Mar. 21  
Apr. 25  
May 16  
Jun. 20  
Jul. 18  
Aug. 22  
Sep. 19  
Oct. 17  
Nov. 14  
Dec. 13 Party

### 1997 SAC Star Parties

Date	Sunset	Moonrise
Jan. 4	5:37PM	3:50AM
Feb. 1	6:03PM	2:35AM
Mar. 1	6:28PM	1:23AM
May 31	7:34PM	3:01AM
Jun. 28	7:44PM	1:43AM
Jul. 26	7:34PM	12:25AM
Aug. 30	6:58PM	4:56AM
Sep. 27	6:20PM	3:46AM
Oct. 25	5:46PM	3:33AM
Nov. 22	5:25PM	1:18AM
Dec. 27	5:31PM	6:22AM

## SACNEWS

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

Stamp

First Class Mail

### Inside:

- Getting Started by Will Milan
- Dim Moments by Paul Dickson
- Comet Comments by Don Machholz
- Fuzzy Spot by Ken Reeves
- Kamakaze Star Hopping by Paul Dickson

SAC Meeting — July 18  
Deep-Sky Meeting — July 24  
SAC Star Party — July 26