Saguaro Astronomy Club

Metro Phoenix, Arizona

SACNEWS

July 1996 — Issue #234

v7.1

Taming the NGCs

by Jack Jones

How many NGC objects can I see with my telescope? How many planetaries are in the NGC catalog? How many NGC objects are double stars? Triple stars? What IC object is a photographic plate defect? Rainman Software has created a program called NGCView that they call the premier observational planning and logging software for the deep-sky astronomer. It is a sophisticated interface to the integrated New General Catalog 2000.0 database of 13,226 (all 7840 NGC and all 5386 IC) objects published in 1988 by Sky Publishing Corp and Cambridge University Press, and runs in Windows 3.11 and Windows 95.

Enter the date of your next observation session and the program displays a beautiful graphic representation of a 24-hour day on the horizontal axis, and zero thru ninety degrees on the vertical axis. Day, twilight, and night are marked off. Superimposed on this graph is a sine-wave of the chosen object's position in the sky throughout the selected 24-hour period. The color program also can print in color and has red-screen capability for laptop use in the field.

I have been playing around with this program for several weeks now, and I never thought I could ever have this much fun with statistics. The real power of the program, however, comes from its sorting capability and its ability to generate and print observing lists and observing logs from the results of these sorts. You can sort through the 13,226 objects using the original Dreyer Description of size, shape and brightness as well as constellation, object type and positive elevation for a given observing period. NGCView can be used both as an observational planner and as an observational tool. As a planner, you can generate an object list which includes a time versus altitude display for the evening. As an observation tool, you can quickly enter the type of object you wish to see, and it will find all matches and track the targets you choose. Sky Atlas and Uranometria chart numbers are included to help you locate the objects.

Quick Calendar

SAC Star Party
Buckeye Hills Recreation Area
Saturday, July 6

SAC Deep-Sky Meeting
March, April, and May *What's Up* Columns
7:30, Thursday, July 11

SAC Meeting
7:30 PM, Friday, July 26

NGCView is ideal for amateur astronomers who have spent some time looking at the Messier objects, and want to explore the larger realm of deep sky objects in an organized manner, using prepared lists such as the R.A.S.C.'s 110 Finest NGC Objects, the Herschel 400, or the new SAC 110 Best of the NGC. You might assemble a list of all planetary nebula visible with a given aperture, or jump into the 1000+ observing program.

According to Rick Sprenkle, owner of Rainman Software (`rainman@rainman-soft.com`):

"Since the NGC was generated using telescopes up to 72″ of aperture, one expects that an extremely faint NGC object may be next to impossible to see using an 8″ telescope. Unfortunately, one can't rely on the published values of total magnitude to determine if the object will be visible. For example, IC 2256, which has a total magnitude of 15.0, appears about as bright as

SAC Officers

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	`a.crayon@az05.bull.com`	
SACNEWS Editor	Paul Dickson	862–4678
	`p.dickson@az05.bull.com`	

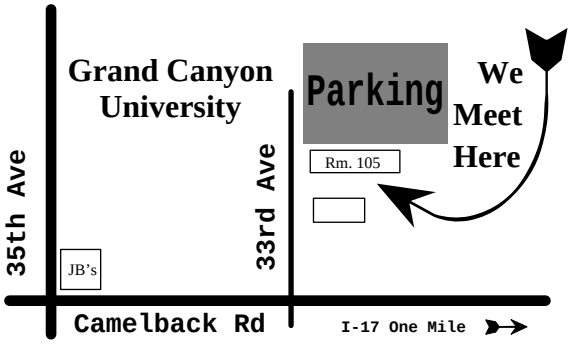
NGC 4945 at magnitude 9.0. Surface brightness, not total magnitude, is the key to determining how bright a distributed deep sky object will appear. Numerical values for surface brightness can be misleading as well, because they make certain assumptions about the distribution of light — assumptions that fail for irregularly shaped objects. An easier way to determine how bright NGC objects will appear is to use Dreyer's original visual descriptions. He used an abbreviated, somewhat cryptic format to record his visual impressions. NGCView is one of the first programs to make Dreyer's descriptions part of the database. Visual descriptions of brightness, size, and shape have been expanded into plain text and are available for filtering and sorting. Many amateur astronomers have found this unique feature extremely valuable when planning their observations."

Since my present interest is to commence observing *SAC's 110 Best of the NGC*, the first thing I did was to set the filters to give me the Herschel 400. I further filtered this to extract only existent NGC objects of sufficient brightness in the Northern hemisphere that were not Messier objects. I then sorted by Right Ascension. This pretty much got my list close enough to where it was a simple task to individually check each entry and add or subtract objects until all entries matched the exact "Best Of" list.

My next task was to page through the graphs of those objects visible in the sky now, and find any sneaky objects that, if I didn't observe them soon, would mean a long wait before they popped up again. Of course anything circumpolar I wouldn't have to worry about too much, but those with a pronounced southerly declination could mean trouble. It turned out I had about a dozen problem children I had better dispose of at the next observing session that

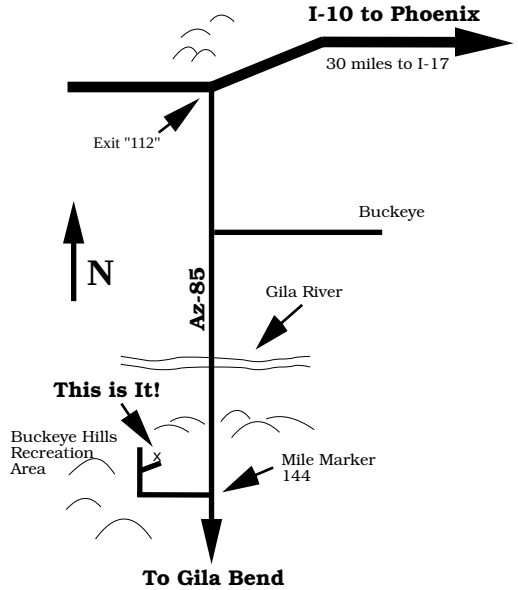
Directions to SAC Events

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.



were still adequately observable in a dark sky. Then I could observe the rest at a more relaxed pace and at their optimum altitudes in the coming months. (I promise to come back to the problem children next year and observe them at a more respectable altitude: I just don't want to have to wait a year and a half for my plaque!)

After I have viewed the objects, I can create a log that prints out all pertinent data in paragraph text format, and then add my own comments to the report. This feature is guaranteed to make the sternest Deep-Sky Observing Coordinator jump for joy. Amazingly, the program also contains an observing history filter that, in conjunction with the observing log, sorts out any objects form an observing list you have already seen. If you were to, say, go through the Herschel 400 a for second time with a new telescope, you could further refine the filter to disregard Herschel 400 objects already observed with the new telescope!

My favorite feature though is the Find function. Push F2 or click, and you get a calculator-style window to enter the Messier, NGC, or IC number, and all info on the object is instantly displayed. How many objects can I see with my telescope? I can see over 6,000 that are just galaxies. How many doubles did the NGC pick up? There are 50 double stars and 22 triple stars. The photographic plate defect is IC 3601.

NGCView comes compressed on two 3.5″ disks and costs $39.95 plus $3 shipping. It takes up about 5 MB after installation and, being a massive number-cruncher, benefits from the faster processors. A 386 with a math co-processor and 4MB RAM would be the bare minimum if long waits are to be avoided. The program calculates rise and set times for the date of your choice almost instantaneously on a Pentium, but takes several minutes on a 386SX when using Local Standard Time. Calculations using the Local Mean Time option would take even longer. To check out the graphics or order, contact:

On the Web: `http://www.rainman-soft.com`
Astromart: `http://www.astromart.com`
Astronet: `http://www.rahul.net`
Internet (E-Mail)
`ngcview@rainman-soft.com`
Voice / Voice Mail (24 Hr)
(804) 984–2808
US Mail
Rainman Software
100 Shale Place
Charlottesville, VA 22902-6402

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

Comet Comments

by Don Machholz

(916) 346-8963 `CC215.TXT` June 6, 1996
`DonM353259@aol.com`

1995 O1 (Hale-Bopp)

Date	RA-2000-Dec		Elong	Sky	Mag
06–26	19h01.5m	−12°23′	165°	M	6.4
07–01	18h54.7m	−11°53′	168°	M	6.3
07–06	18h47.7m	−11°23′	168°	E	6.2
07–11	18h40.5m	−10°54′	165°	E	6.1
07–16	18h33.3m	−10°24′	160°	E	6.0
07–21	18h26.0m	−09°55′	154°	E	5.9
07–26	18h18.9m	−09°26′	149°	E	5.8
07–31	18h12.0m	−08°59′	142°	E	5.7
08–05	18h05.5m	−08°32′	136°	E	5.7
08–10	17h59.4m	−08°07′	130°	E	5.6

Comet Hale-Bopp (C/1995 O1) is now visible to the unaided eye — at least to some eyes. The rest of us will have to be content with binocular views of the comet for awhile longer. This comet will likely be a naked-eye object for more than a year, the Northern Hemisphere will see it through mid-May, 1997. This affords an opportunity to conduct an experiment, and to set a personal record: for how long you can follow the comet without optical aid. In 1985–6 Halley's Comet was seen for about seven months, and early in the last century the Great Comet of 1811 was a naked-eye object for about nine months. Simply record the first night you view Comet Hale-Bopp with the unaided eye, and, sometime next May, your last naked-eye viewing. The comet is presently 3.2 AU from us and 4.1 AU from the sun.

Meanwhile **Periodic Comet Kopff** is visible in the same part of the sky, but you'll need a pair of binoculars or a small telescope in order to see it. Other comets that we have been watching have now faded or moved south.

22P/Kopff

Date	RA-2000-Dec		Elong	Sky	Mag
06–26	19h20.7m	−17°28′	165°	M	7.0
07–01	19h21.7m	−18°03′	169°	M	6.9
07–06	19h22.3m	−18°41′	174°	M	6.9
07–11	19h22.7m	−19°22′	177°	E	6.9
07–16	19h23.2m	−20°04′	175°	E	7.0
07–21	19h23.8m	−20°45′	171°	E	7.1
07–26	19h24.8m	−21°25′	166°	E	7.2
07–31	19h26.2m	−22°03′	162°	E	7.3
08–05	19h28.2m	−22°36′	157°	E	7.4
08–10	19h30.8m	−23°05′	153°	E	7.6

Orbital Elements

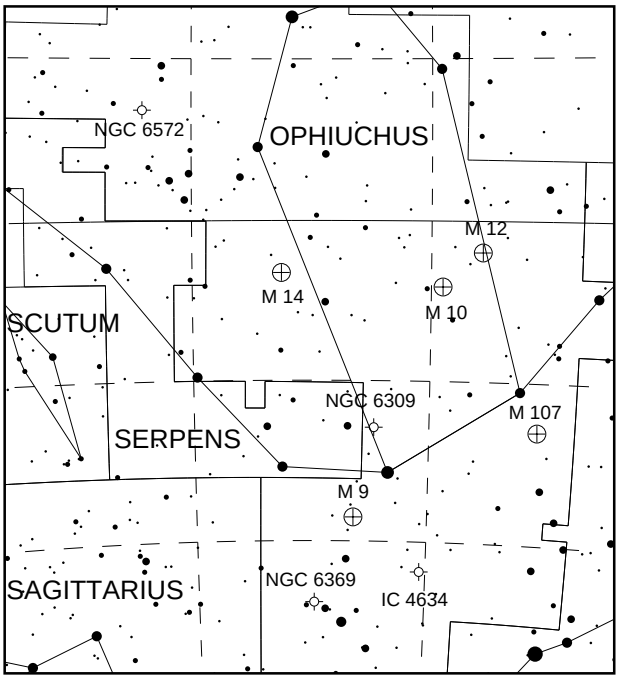
Object:	Hale-Bopp	Kopff
Peri Date:	1997 04 01.14561	1996 07 02.19980
Peri Dist:	0.9140971 AU	1.5795617 AU
Arg/Peri (2000)	130.59227°	162.83487°
Asc Node (2000)	282.47087°	120.91329°
Incl (2000):	089.42807°	004.72143°
Eccentricity:	0.9950784	0.5440739
Orbital Period:	3000 yrs.	6.45 yrs.
Reference:	MPC 26879 (3-26)	MPC 22032 (1991)

What's Up

by Steve Coe

Ophiuchus **July 1996**

Planetary nebulae have always been a source of fascination for me. I know that the first time I saw the Ring Nebula and then the Dumbbell Nebula in one night with my first telescope, an 8″ $f/6$, I was hooked. That misty, light green glow was unlike any other object I had viewed and I am still enthralled to this day. There



are few big, bright planetary nebulae in the sky, Charles Messier only spotted four: M 27, M 57, M 76 and M 97. Obviously, modern catalogs include many more planetaries, but none are obvious in amateur scopes. The constellation of Ophiuchus (The Snake Handler) is at the western edge of the Summer Milky Way, so it has many of these fascinating objects within its' borders. Just going from west to east in RA, the four planetaries I have chosen this month get better and better, see if you agree.

IC 4634 is a pretty bright, but extremely small planetary. This elongated, greenish dot is floating in a very nice Milky Way field at 17 hr 01.6 min and −21 50. Averted vision makes it grow to about three times the size of the Airy disk in my 13″ at 330X.

NGC 6309 is pretty bright, small, elongated NW-SEE and not brighter in the middle at 165X. This planetary hides in a rich Milky Way field of view and needs some power to bring it out. Another problem with finding this nebula is that it hides near an 11th magnitude star and looks like a double star at low powers. There is another star which brackets this nebula on the other side, but it demands 220X to see. When you find this planetary, make certain to try some higher powers. It is at 17 14.1 and −12 55.

NGC 6369 is at 17 29.3 and −23 46, which puts it within the "Bowl" of the dark Pipe Nebula, so there are few field stars surrounding this planetary. At 220X in the 13″ it is bright, large and little elongated 1.2 X 1 E-W. This planetary is much brighter on the north side and is annular with averted vision at 220X. It was immediately obvious at 100X and was light green at all powers. On a great night in the Central Mountains, with 7/10 seeing and 9/10 transparency, I saw the annular hoop of this nebula easily and my notes say the north edge is brighter at 220X. Raising the power to 330X did not show off any new details, only made the light green color less obvious. I have never seen the 16th magnitude central star at any time. The SAC database says that the nickname for this object is the "Little Ghost," I have no idea why this planetary would acquire that name.

NGC 6572 is bright, large and elongated 1.5 X 1 in PA 75 using 220X in the 13″. The central star is held steady in good seeing conditions. Other times the center will just brighten up somewhat. The noteworthy aspect of this gem is its' color. In every scope I have ever owned, from an 8″ to an 18″, this is the greenest nebula I have ever seen! This guy is as green as an Irishman's coat on St. Patrick's day. Alright, alright, it is as green as Lime Jello. Once you pick out this beautiful Easter Egg afloat in the Milky Way, look for a dim outer haze, first seen by John Herschel. I see the faint outer section better with averted vision is a smaller scope. I had a chance to view this lovely nebula with a 36″ $f/5$ recently and it was a luminescent green with an obvious blue-white central star. The dim outer section was much larger than the bright middle section. Look for yourself at 18 12.1 and +06 51.

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

Gerry Rattley opened the May meeting and talked about the star party on June 8 at Buckeye. He mentioned that the park is actually closed, but that we still use it. A discussion was held about the "I can't make it to the Grand Canyon" star party at Dugas.

Visitors were asked to introduce themselves. We had 5 guests at the meeting.

Regina Lawless gave the treasurers report.

A.J. Crayon talked about the different awards that the club gives out for your observations. He gave out the award for the Messier Catalog to Chuck Hilliger.

Paul Dickson talked about EVAC's bus tour of Lowell Observatory on July 20. The cost of the tour is $15. He also had copies of the SAC Best 110 NGC.

Rich Walker talked about public star parties. The

Thunderbird public star party was a great success due to the fact that the crowd wasn't out of hand. Coming up is the summer star party on June 22 at Reach 11 Park.

Pierre Schwaar discussed an observing challenge of where Venus will be 4 degrees E of the Sun on June 8.

Paul Dickson discussed where to get your slides put on PhotoCD. Adam Sunshine talked about the piece of space junk that was seen at the Sentinel Star Gaze. He showed us overheads of the track of the space junk.

Chris Schur showed us some brand new slides of a number of summer objects.

There were 47 people at the break.

After the break Steve Coe introduced John Spencer from Lowell Observatory and his talk was about the the Great Comet Crash 2 years ago. This event allowed scientists to observe large impacts first hand and see if the theories are correct. He discussed other possible impacts in the solar system and their implications.

After the meeting, we went to JB's to eat and talk astronomy.

—David Fredericksen, SAC Secretary

SACNEWS Puzzle #2

by Paul Dickson

CLAP C
CB LUV
CALM COT
GO A PACE
SPEC

Let's try this second batch a second time. Last month, this puzzle got label "answers" by mistake.

Each line refer to a constellation, with each letter refering to the first letter of a bordering constellation. The puzzle is to figure out what constellation shares all of its borders with the given constellations. These are sorted north to south.

The Dugas Star Party

A.K.A.

"I can't make it to the Grand Canyon Star Party"

by Steve Coe

Saturday, June 15th was a star party at the Dugas Road meadow for those of us who were not able to get all the way up the Grand Canyon for the observing session there. Curt Taylor, Dave Fredericksen, Bob Kelley met us at the Cave Creek Road exit off I-17 and then made our way up to the site. We were amazed to see that about 20 scopes were already set up when we arrived, just at sunset. During the hour or so until it got dark, we set up the scopes and had a sandwich in anticipation of a great night of observing. As that hour of twilight passed, more and more folks arrived, so that as dark skies started I counted 35 scopes and about 50 folks in attendance. It was going to be a great night!

I started observing some objects in Ursa Major and when I swung the 13″ onto M 101, I was happy to see lot of detail in the arms of that face-on galaxy at 150X. David and I agree that the transparency was rated at 8 out of 10, however the seeing was a bit "twinkly" and I gave it a 6. I had a chance to observe the Veil Nebula in Paul Lind's recently completed 14″. Using a 35mm Panoptic eyepiece and a UHC filter the detail was stunning, that lovely twisted pattern of nebulosity was longer that the field of view and many bright sections within the Veil where seen. By this time the goodies in Scorpius were up nicely and I spent some time with M 4. Even at 330X it showed 250 stars resolved and many delicate chains of stars.

Comet Hale-Bopp was prominent in binoculars, and at 220X in the 13″ showed a 15 arc-min tail that is very wide. The coma is getting pretty bright and the nucleus shows a small spike to the north.

All in all, a very fun star party and quite well-attended.

'98 Eclipse Cruise

I am just gathering some info on a cruise to the Feb. 26, 1998 total solar eclipse. We are looking at the possibility of either chartering our own ship, probably from Holland American Line, leaving San Juan Puerto Rico, with a stop at St. Thomas, plus another stop and then on to Aruba for the eclipse on that Thursday. This depends on the amount of hurricane damage to St. Thomas. and so all that can be said right now is that there will be two stops in route to Aruba.

Whatever the scenario, a deposit of $500 will be needed to confirm and hold your space on the cruise. With the total amount due by Dec. 1, 1997. The complete cruise package will range from $1850 to $3500 per person, this includes air fare from your departure city to San Juan. The category and location of your cabin on the ship will determine the price.

So, our travel agent for this rendezvous with darkness at noon is **Barbara Philips** at Regency Travel in Scottsdale, Arizona. She is not an astronomer, but is learning by being around me for several hours. Barbara can certainly answer any questions you might have concerning the cruise ships or accommodations. You may reach her at **(602) 596–6787**, or **(800) 796–8024** outside AZ.

I know this seems very distant, but putting a group of this size together requires advance planning. I have no doubt that a winter eclipse in the Caribbean will attract large numbers of observers, so get on the phone to Barbara if you are interested in sailing with us.

Lowell Observatory Tour

Saturday, July 20, 1996

The **East Valley Astronomy Club** will be taking a busload of people to Flagstaff to tour Lowell Observatory. In a effort to help fill the bus, SAC members are invited to attend. They will visit the original site in Flagstaff at Mars Hill and the dark-sky site at Anderson Mesa, 20 miles to the south. The tour promises to be more behind-the-scenes than the typical tour.

Here's a rough itinerary, subject to slight changes:

Mars Hill:

Clark 24-inch refractor: A historic instrument, built in 1896, which was used in Percival Lowell's famous observations of Mars.

The Pluto Camera: Clyde Tombaugh discovered Pluto using plates from this astrograph in 1930. The telescope and dome were refurbished in 1935.

21-inch photometric telescope: This instrument is used primarily for accurately measuring the brightness of stars.

The Rotunda: Originally the library, this historic room contains exhibits concerning the early history of the observatory, including the blink comparator used by Tombaugh in the Pluto discovery.

Anderson Mesa:

The Perkins 72-inch telescope: Shared with Ohio State University, this telescope is used mostly for taking spectra.

Hall 42-inch telescope: The observatory's workhorse telescope, used for a variety of different types of observations. The telescope features a large spectrograph used for the study of sun-like stars.

Navy Prototype Optical Interferometer: The world's largest interferometer operating in visible light. It enables extremely precise measurement of star positions and even imaging of star surfaces.

Cost: The trip is $15, which will pay for the chartered bus and tour guide expenses.

Where & When: The group will meet at 7 AM sharp at the Valley Fair Shopping Plaza, on the southeast corner of Mill and Southern, in Tempe. We should get back by 9 PM.

What to Bring: A **sack lunch**, for a picnic in Flagstaff. **Warm clothes** and an **umbrella**—it's the monsoon season at high elevation. **Money**—there will be a fast food stop on the way back and Lowell has a new visitor center and gift shop.

Here's how to get on this trip: Send you name, phone number, and number of people, along with a non-refundable check to **"East Valley Astronomy Club"** for $15 per person to:

Sheri Cahn
4220 W. Northern #116
Phoenix, AZ 85051-5757

Please be advised. Sheri Cahn will be out of town after July 7. If you want to attend this tour, you will need to get the check into the mail by **July 3rd**.

Deep-Sky Meeting

The Deep-Sky Group is a Special Interest Group made up of people who like to discuss observing and observing techniques. They particularly like to observe objects out past the Orrt Cloud that's why they're called the Deep-Sky Group. The type of objects include stars, nebula and galaxies.

If you are interested in sharing your observations, or are interested in observing techniques, then by all means come join in. The meetings are held at John McGrath's house every other month; directions are found on page 2 of this newsletter.

Consider this to be an invitation to this meeting. This meeting is OPEN to all SAC members. All you have to bring is an interest in what objects look like when view through a telescope. Follow the directions to the McGrath's.

For the July Deep-Sky Meeting we will discuss the objects in Steve Coe's *What's Up* column. At the May meeting, Comet Hyakutake was the topic. At the time this is being written, the Deep-Sky Chairman is out-of-town, so this month's topic might be the March, April, and May columns, or it may just be May and June columns. A.J. will announce the constellations at the June SAC meeting.

This month's meeting, on July 11, will follow nearly two weeks after the SAC meeting due to the Independence Day Holiday.

July 1996

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			Comet Hale-Bopp at opposition	Jupiter at opposition	**TAAA Meeting** (Tucson)	**SAC Star Party** Buckeye Hills (members&guests)
	1	2	3	4	5	6
Last Quarter Moon 11:56 A.M.			**EVAC Meeting** (SCC: Rm. PS172)	**SAC Deep Sky Meeting** 7:30 P.M.	Mercury at superior conjunction (moves into evening sky)	
7	8	9	10	11	12	13
	New Moon 9:16 A.M.			Neptune at opposition		Sun enters Cancer 2 A.M.
14	15	16	17	18	19	20
		First Quarter Moon 10:51 A.M.		Uranus at opposition	**SAC Meeting** Grand Canyon University, Fleming Rm. 105	
21	22	23	24	25	26	27
		Full Moon 3:37 A.M.		All Times are Mountain Standard Time		
28	29	30	31			

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, and phone number in the space below.

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

Regina Lawless
SAC Treasurer
5808 E Turquoise,
Scottsdale AZ 85253

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.

1996 SAC Meetings

Jan. 5
Feb. 2
Mar. 8
Apr. 5
May 31
Jun. 28
Jul. 26
Aug. 30
Sep. 27
Oct. 25
Nov. 22
Dec. 14 Party

1996 SAC Star Parties

Date	Sunset	Moonrise
Jan. 20	5:48pm	8:50am
Feb. 10	6:08pm	12:10am
Mar. 16	6:36pm	5:16am
Apr. 13	7:02pm	4:00am
May 11	7:16pm	2:34am
Jun. 8	7:33pm	1:15am
Jul. 6	7:43pm	11:57pm
Aug. 10	7:16pm	4:46am
Sep. 7	6:43pm	2:26am
Oct. 5	6:06pm	1:11am
Nov. 2	5:35pm	11:54pm
Dec. 7	5:21pm	5:02am

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.

SACNEWS

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

Stamp

First Class Mail

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- The Dugas Star Party by Steve Coe
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- Lowell Observatory Tour — July 20
- SAC Meeting — July 28