Saguaro Astronomy Club

Metro Phoenix, Arizona

SACNEWS

June 1997 — Issue #245

v5.20

Getting Started
Astrophotography for Everyone
by Wil Milan
Part I

Sooner or later every budding astronomer starts thinking about taking photos of the night sky. It's a natural progression: Seeing all those splendors in the eyepiece, who would not want to show them to others? And what better way than a photograph?

And there are other reasons: The truth is that the human eye, marvel that it is, cannot accumulate light the way photographic film and CCD sensors do. The result is that on film or CCD one can capture and view many things which the eye cannot see. An example of this is the famous Horsehead Nebula: Very easy to photograph even with simple equipment, but very difficult to spot visually even with large telescopes.

The hitch comes when one discovers the type of equipment top-notch astrophotographers use. Very expensive optics such as Schmidt cameras and apochromatic refractors, finely crafted (i.e., expensive) mounts and computerized drive systems, exotic films which require laborious preparation and darkroom work to get the finest results. Some use CCD cameras which sell for thousands of dollars. It's all very fascinating, but also very discouraging: Who can afford all that?

The truth is one does not have to have much equipment to get started in astrophotography, and very good astrophotos can be taken with fairly modest equipment. Nor does it have to be all that difficult: For some types of astrophotography the only skills needed are to be able to click the shutter button and count.

Why it can get expensive — and why it doesn't have to

The level of expense and complexity of astrophotography relates directly to the type of object being photographed. Small, dim objects such as the Ring Nebula require long focal lengths, very long exposures, special films, and other things which make going after such objects a very tedious and expensive proposition. The good news, however, is that many of the finest sights in the sky are neither small nor dim, and thus they can be very well photographed with simple equipment and no great skill.

The best example of this is the moon. The moon is not only the most prominent but also one of the most captivating sights in the night sky. It is also very easy to photograph using very simple equipment. Yes, fancy

Quick Calendar

Grand Canyon Star Party
Grand Canyon
June 7–14

Astronomy Novice Meeting
Steve Coe's Home, See Page 6
7:30–10 PM, Thursday, June 12

SAC Meeting
RTMC in Review / Annual Swap Meet
7:30 PM, Friday, June 20

SAC Star Party
Buckeye Hills Recreation Area
Saturday, June 28

SAC Officers

Area Code (602)

President	Adam Sunshine	780–1386
	asunshine@netzone.com	
Vice President	Gerry Rattley	892–5698
Treasurer	Regina Lawless	
Secretary	David Fredericksen	979–0513
Properties	Jack Jones	944-5488
	jjones@starlink.com	
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	

equipment can reveal lunar details that simpler equipment will not, but it is very easy to take some very nice photos of the moon without spending a fortune. Likewise with constellations, star fields, the Milky Way, and many other interesting objects: taking good photos of them can be easy and inexpensive. In next month's column we'll discuss how to do that; this month we'll discuss what equipment you need.

Three types of astrophotography

There are three basic types of astrophotography:

1. Fixed-camera photography, which is just what it sounds like: a camera on a fixed tripod.

2. "Piggyback" astrophotography, meaning a camera with its own lens tracking the motion of the stars by riding atop an equatorially-driven telescope.

3. "Prime focus" or "eyepiece projection" photography, which is a camera photographing through the telescope itself, using the optics of the scope to form the image on the film.

Number 3 is the difficult one, the one which requires all the expensive equipment and lots of effort and skill. But for 1 & 2 you need a lot less, and in this series those are what we'll consider. (If you're interested in number 3 I commend your ambition, but it is far beyond our scope to cover it here.)

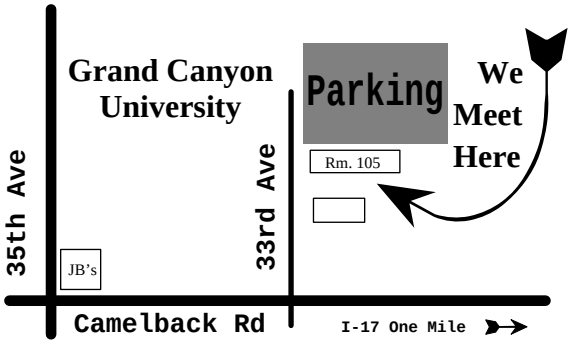
Fixed-camera photography

Fixed-camera photography requires only three things:

• A camera with a manual (i.e., non-automatic) shutter which can be held open for several seconds to several minutes. Cameras with fixed (i.e., non-removable) lenses usually cannot do this, but most cameras which have interchangeable lenses have a "bulb" or "time" shutter setting

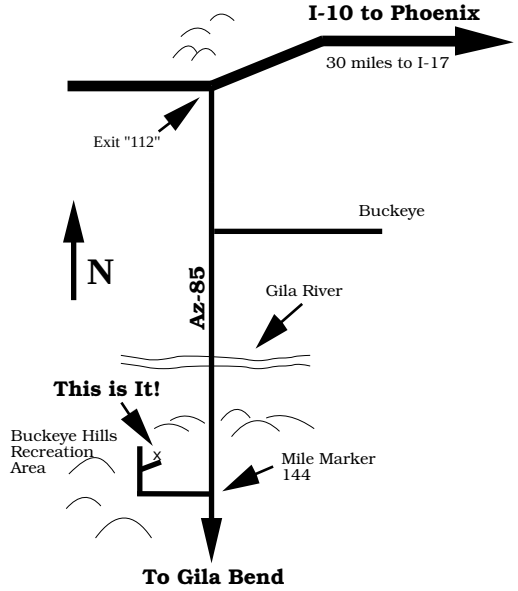
Directions to SAC Events

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.



just for this purpose. This was a standard feature on most older 35mm cameras, so if your present camera doesn't have a "bulb" or "time" setting it would be inexpensive to purchase an old used camera just for the purpose. The standard lens which comes with most cameras will work just fine for this kind of photography.

• A cable release. This is a short cable which is used to open the camera shutter and hold it open. You can purchase one of these at any camera store for a few dollars.

• A tripod. This need not be a very expensive tripod, but it should be able to lock the camera rigidly wherever you point it. (Note that many video tripods, such as for camcorders, do not have lock knobs and therefore cannot lock the camera in place. You need a tripod made for a still camera.)

Fixed-camera photography is the easiest entry there is into astrophotography. It is very easy to do, can yield visually stunning results, and if you shop the used market you can get everything you need for as little as $100.

Piggyback astrophotography

For piggyback astrophotography you need a camera, lens, and cable release just as for fixed-camera photography, but in addition you need two more things:

• A telescope with an equatorial mount and clock drive. Ideally the mount and clock drive should have some means of making driving corrections, but that is not strictly necessary.

• A bracket to bolt the camera atop the telescope so that both the camera and telescope can point in the same direction. If you have a telescope with a long tube (such as most refractors and Newtonians) the bracket will have to be high enough and far enough forward on the telescope that the scope tube will not intrude into the field of view of the camera. Piggyback brackets are available as aftermarket items for most telescopes. (With simple tools and a little ingenuity it is also possible to make a piggyback bracket, if one is not available for your scope.)

Piggyback photography is in many ways the most rewarding type of astrophotography. If you already have an equatorially-driven telescope, for very little more effort you can take some wonderful deep-sky photos, photos which can rival those taken with the most expensive setups. And if you aspire to high-end prime focus astrophotography, piggyback astrophotography is the best training there is: the procedure is much the same, but piggybacking is much more forgiving of beginner's errors and does not involve many of the complexities which can make prime-focus photography so frustrating to the newcomer. Even though I've done and still do a lot of prime-focus photography, I also do a lot of piggyback photography (often I do both at the same time, shooting with one camera atop the scope at the same time I am photographing with a second camera through the scope). There is literally no end to the fine astrophotos one can take with a simple camera, lens, and equatorial mount.

Next month

With the equipment above, plus some film and dark skies, you'll be able to take some wonderful astrophotos. In part 2 of this series we'll discuss how to do that.

Comet Comments

by Don Machholz

(916) 346–8963 CC226.TXT May 7, 1997
DonM353259@aol.com

1995 O1 (Hale-Bopp)

Date	RA-2000-Dec		Elong	Sky	Mag
05-22	05h35.1m	+14°36′	24°	E	1.7
05-27	05h45.1m	+12°17′	23°	E	1.9
06-01	05h54.4m	+10°05′	22°	E	2.2
06-06	06h03.2m	+07°59′	22°	E	2.5
06-11	06h11.5m	+05°58′	22°	E	2.7
06-16	06h19.4m	+04°00′	22°	E	2.9
06-21	06h27.0m	+02°06′	22°	E	3.2
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

Comet Hale-Bopp is now visible in the Southern Hemisphere after putting on a fine show that will be studied for years. **Periodic Comet Wild 2** remains in our evening sky. **Periodic Comet Encke** is close to the sun now, but in late June it emerges into the southern sky. I'll provide those positions next month.

Two faint comets were recently discovered by Joe Montani at Kitt Peak. Found on plates taken April 9 and April 12, **Comets C/1997 G1 (Montani)** and **C/1997 G2 (Montani)** will remain faint. Meanwhile, Jean Mueller has made her twelfth photographic comet find, this as part of the Second Palomar Sky Survey. **Comet C/1997 J1 (Mueller)** has reached perihelion (2.3 AU) and is now dimming.

81P/Wild 2

Date	RA-2000-Dec		Elong	Sky	Mag
05-22	10h04.3m	+15°11′	87°	E	10.6
05-27	10h16.9m	+14°05′	85°	E	10.6
06-01	10h29.6m	+12°55′	84°	E	10.7
06-06	10h42.3m	+11°43′	82°	E	10.8
06-11	10h55.0m	+10°27′	81°	E	10.9
06-16	11h07.7m	+09°09′	80°	E	11.0
06-21	11h20.3m	+07°50′	78°	E	11.2
06-26	11h32.9m	+06°29′	77°	E	11.3
07-01	11h45.4m	+05°07′	75°	E	11.4
07-06	11h57.8m	+03°45′	74°	E	11.5

Orbital Elements

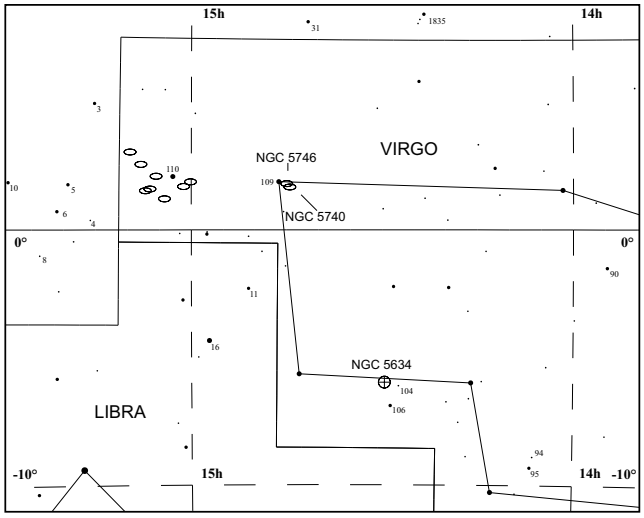
Object:	Hale-Bopp	P/Wild 2
Peri Date:	1997 04 01.13800	1997 05 06.62789
Peri Dist:	0.9141405 AU	1.5826156 AU
Arg/Peri (2000)	130.58915°	041.77000°
Asc Node (2000)	282.47069°	136.15458°
Incl (2000):	089.42943°	003.24276°
Eccentricity:	0.9951172	0.5402220
Orbital Period:	~2500 years	6.39 years
Reference:	MPC 29568	MPC 28272
Epoch:	1997 06 01	1997 04 22
Absol Mag/"n":	−1.0/4.0	7.0/6.0

Fuzzy Spot

by Ken Reeves

Virgo (West) **June 1997**

Virgo is such a large constellation and contains so many objects that I like to split it up into three areas: Virgo (north) which is north of 0 degrees of declination and east of 13 hours of right ascension, Virgo (south) which is south of 0 degrees of declination and east of 13 hours of right ascension, and Virgo (West) which is west of 13 hours of right ascension. This makes it slightly more manageable and much more approachable.



This month, instead of focusing on Best of the NGC or the Herschel 400 objects, I am going to focus on a group of 8 galaxies (as shown in *Sky Atlas 2000*) in the far west of the constellation of which 5846 is the only Herschel in the group. For those of you with big aperture, *Uranometria 2000* shows 16 galaxies in this area.

All of these observations were made in my 10″ telescope at Sentinel on a night I rated 7/10 for both seeing and transparency. Before I get to this group, I have my observations for a couple of other object in the area that are fairly close by, and well worth the chase.

NGC 5634 (14h29.6 −05°59) Yes, there is something in Virgo besides galaxies! At 100X, this globular cluster is in the middle of the short leg of an isosceles triangle. I saw it as pretty bright, round, with a granular center and a faint halo, and suspected resolution of a few stars. Increasing power didn't help much and I was unable to resolve any more stars at higher power.

NGC 5740 (14h44.5 +01°41) and **NGC 5746** (14h45.0 +01°49) This pair of galaxies are fairly close together and make a nice comparison couple. I recommend searching out 5746 first then go south to 5740. 5746 is a very nice edge on galaxy, pretty bright, pretty large, very nice bright bulging center, and a possible dust lane. The elongation is N/S with the halo extending more to the S than the N. Photographs show halo as even on both sides, so this may be an optical illusion due to a star on the N side. 5740 is not nearly as bright, somewhat small, slightly brighter middle. Averted vision does make it grow slightly and shows some elongation NW/SE.

NGC 5846 (15h06.5 +01°36) This Herschel 400 galaxy is in a grouping of 8 galaxies shown on *Sky Atlas 2000*. This galaxy is pretty bright, somewhat big, possible slight elongation N/S, with a bright middle and a sharp stellar nucleus that comes and goes. There is a star immediately to the south, which upon investigation turns out to be galaxy 5846A. The remaining objects are the other 7 galaxies shown on *Sky Atlas 2000*.

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

June Club Meeting

The program for the June SAC meeting will be in two parts.

The first half will be members' slide night. Share your shots of the Riverside Telescope Makers Conference (RTMC), the Comet, the Texas Star Party, or any other astro-stuff you've got.

The second half will be the annual swap meet. Get the old junk out of your closet or the what-cha-ma-call-it you just brought back from Riverside and bring it in to trade for new junk or just sell it. Remember: "Your junk can be another man's treasure."

—*Gerry Rattley, SAC Vice President*

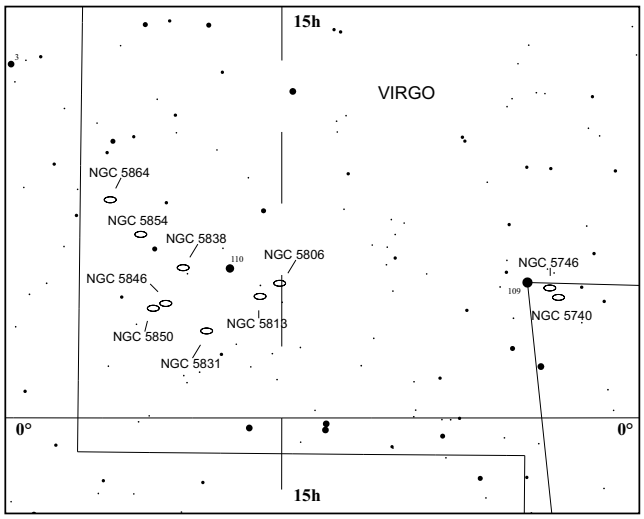
Minutes from the April Meeting

The meeting was called to order by the President at 7:30 PM and the first order of business was a call for visitor introduction. Thirteen people introduced themselves and members of their families!

Steve Coe discussed the upcoming 20th anniversary banquet on Friday, May 30th. Get your reservations and $20 check to the treasurer quickly as the time is approaching. The eclipse cruise has two full cabins left so if you are planning on this trip and have been waiting for the last minute, now is the time.

Rich Walker discussed the most extremely successful Thunderbird Park public star party. Many thanks to EVAC and Sun City Astronomy Clubs for their support.

NGC 5806 (15h00.1 +01°53). This is a neat galaxy situated smack dab in the middle of a square of stars. It is pretty small, somewhat faint with a very faint halo and a little brighter middle. I was unable to tell if there was any elongation.



NGC 5813 (15h01.2 +01°42). This galaxy is pretty faint, not too small, elongated NW/SE, brighter middle, and a very faint halo.

NGC 5831 (15h04.2 +01°13) This galaxy is the only object in the group that I was unable to locate during my outing at Sentinel. According to Christian Luginbuhl and Brian Skiff in the *Observing Handbook and Catalogue of Deep-Sky Objects*, this object is "...moderately faint in 15 cm, less than 1′ diameter, and has a small, nonstellar nucleus." The NGC descriptions is "pretty Bright, Small, much brighter Middle."

NGC 5838 (15h05.5 +02°06) This galaxy is fairly bright, elongated NE/SW, has a bright middle, and a fairly faint halo. An extra treat for observing this galaxy is a nearby white/blue double star.

NGC 5850 (15h07.2 +01°32) This galaxy is a neighbor to 5846, is much fainter, has a bright possibly stellar nucleus and a very faint halo. No elongation was noted.

NGC 5854 (15h07.9 +02°34) This galaxy is somewhat bright, brighter middle, and elongated NW/SE. It is in a quadrilateral of stars.

NGC 5864 (15h09.6 +03°03) The last of the galaxies in this group is somewhat bright, not very large, slightly elongated E/W, contains a pretty faint halo with a slightly brighter middle. Averted vision tends to make the halo more round.

Herschel 400 Objects

4900, 4958, 4995, 5054, 5363, 5364, 5566, 5576
5634, 5746, 5846

SAC's 110 Best of the NGC Objects

5746

For coming attractions, we will have another public star party at Thunderbird Park on May 10th. You'll not want to miss this one.

Paul Dickson discussed his Messier and 110 Best NGC Log Books which sell for $15.00 and $5.00 respectively. He displayed the index for the under construction Herschel 400 Log Book which should be available by the next meeting. The index has a total of 12 single-sided pages.

A.J. Crayon discussed the Deep Sky Group which meets next month, advertised 20th anniversary T-shirts selling for $12.00 each. Finally the awards for the March Messier Marathon were presented to club members.

Regina Lawless gave the Treasurer's report. In short SAC is in good financial condition.

For the show-and-tell four members had slide presentations of, you guessed it, Comet Hale-Bopp. Mike Lerch, Pierre Schwarr, AJ Crayon and Chris Schur were the presenters.

At this time there were 48 members and visitors in attendance.

Mike had pictures from three different films, one through the telescope showing the corkscrew structure of the coma. Pierre covered more than just Hale-Bopp, AJ had a nice picture flashed by Steve Coed with himself, a Palo Verde and an airplane in addition to the comet. Chris dazzled everybody with his selection which included three pictures of syncrones in the dust tail. For more information about syncrones, see Chris.

Gerry Rattley gave an update on his discussing of Super Nova from last month.

After the meeting 18 people adjourned to the nearby restaurant for nourishment and astronomical discussion.

—*A.J. Crayon, Acting SAC Secretary*

Cruise to '98 Eclipse

Steve Coe

As many of you know, there is an excellent solar eclipse on Feb. 26, 1998 near the Caribbean island of Aruba. Princess Cruises is planning a week long cruise into the path of the eclipse and you can join in with the Arizona eclipse chasers. **There are only 2.5 double occupancy cabins remaining** and they will go quickly on the sparkling new ship, Dawn Princess.

A deposit of $200 will be required to confirm and hold your space on the cruise, with the total amount due by Nov. 1, 1997.

Welcome Aboard agency is holding three cabin types: 8 are BB category, which are outside/balcony cabins @ $2,172 per person; 1 is F category, which is an inside cabin @ $1,846 per person; 6 are JJ category, which are inside cabins @ $1,712 per person.

This price includes round trip air fare to and from San Juan, Puerto Rico and all applicable port taxes for stops in St. Thomas, Dominica, Grenada and Caracus.

Our travel agent for this darkness at noon rendezvous is Biff Treston at Welcome Aboard in Scottsdale, Arizona. He is not an astronomer, but is learning by being around me for several hours. Biff can certainly answer any questions you might have concerning the cruise ships or accommodations. You may reach him at 946–5333 during the day, or 486–2819 at home; speak to Biff or Hymie.

I know that 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 Biff or Hymie if you are interested in sailing to an eclipse.

Being an active Arizona astronomer for 20 years, I know for a fact that there are lots of interesting, exciting, knowledgeable and fun-loving folks around here. That is really the motivating factor about trying to get this together, an opportunity to meet and spend some time with a fun bunch under the Moon's shadow!

Astronomy Novice Meeting

Thursday, June 12, 7:30 to 10 PM

Are you confused by ads in astronomy magazines?

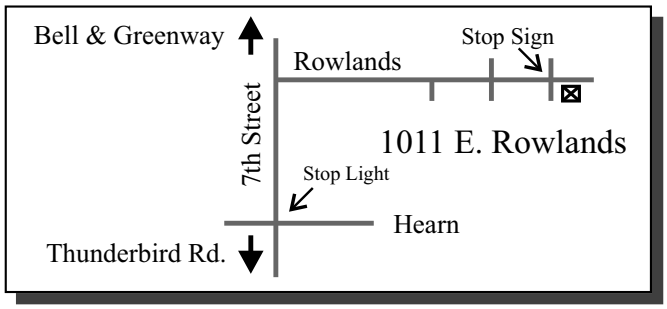
Do you think those numbers on eyepieces are alien code?

Is "Lost in Space" a re-run of your last observing session?

Then this meeting is just for you.

Steve Coe, and his patient wife Linda Ross, will host a meeting designed for those just starting out on their journey to the stars on **Thursday night, June 12th, at 7:30.** Please be on time, the demonstrations need to start in twilight for you to be able to see how the telescopes work. Just bring along a folding chair and your curiosity.

Steve and Linda live at **1011 E. Rowlands** in Moon Valley. From the corner of 7th Street and Thunderbird, go north on 7th Street and through the light at Hearn, the next street you can turn right on is Rowlands. It is the house past the stop sign on the right-hand side. **Phone: 789–7786.**



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 — Binoculars: Celestron 9x63 Pro — Cost $275 — $150 BN. Celestron 12x80 Giant — Cost $395 — $275 BN. Fuji 10x70 FMT Sx Polars — Cost $675 — $500 BN. Virgo HD Mount Cost $130 — $65 LN. Jody Humber, 412–2329.

For Sale — Cardioptrics: MAK 90mm $f/5.6$ 500mm telephoto/spotting scope, 45° 1.25″ erector, 25mm Plössl & $f/4$ converter — Cost $325 — $200 BN. Jody Humber, 412–2329.

For Sale — Tuthill Polaris finder for Celestron/Meade — Cost $200 — $125 BN. Jody Humber, 412–2329.

For Sale — 10″ $f/4.5$ Coulter Dobsonian scope w/ good optics, new rack&pinion focuser, and Telrad. Good condition. $375 OBO. No eyepieces. Pierre Schwaar, 265–5533.

For Sale — 6″ $f/5$ "Companion" Alt-Az scope built by Pierre Schwaar. Like new, metal focuser, red w/ oak stand, rotatable tube, 2 eyepieces: 12.5mm Meade Ortho & 26mm Sirius Plössl. $450 OBO. Pierre Schwaar, 265–5533.

For Sale — Coulter 8″ Dobsonian with a 27mm Kellner & 10mm Plössl. $333 O.B.O. Eric Shaffer, 839–6849.

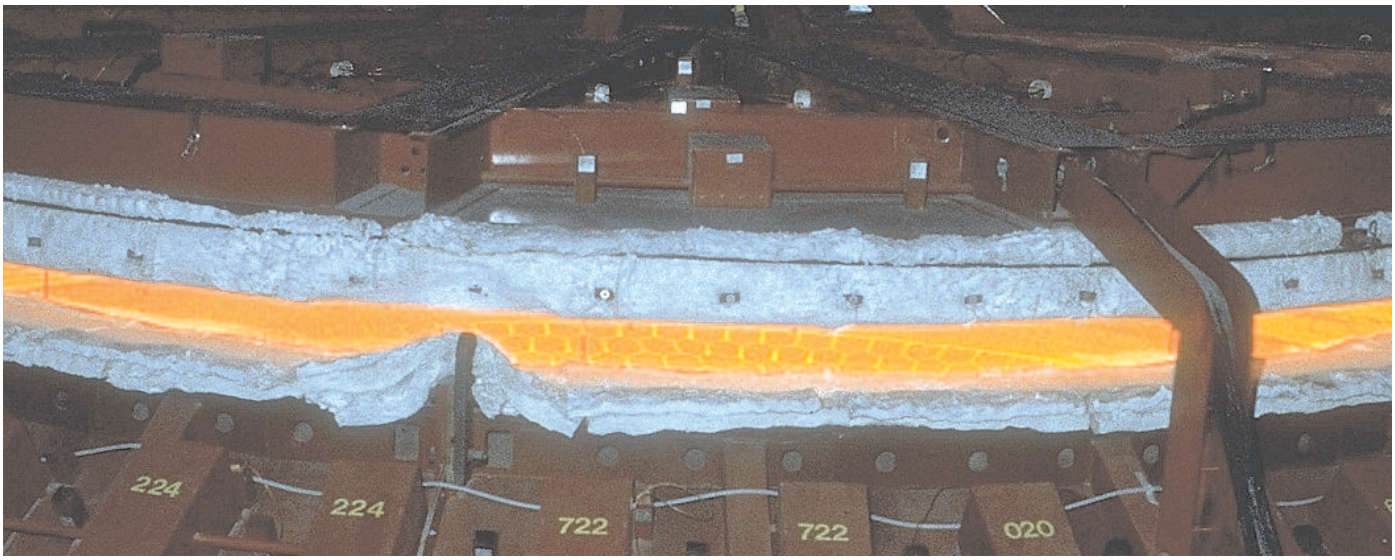


Photo by Dean Ketelsen. On Sunday morning, January 19, (the day after the Open House) the mirror is being cooled off. The lid of the oven is raised to allow the heat to escape quickly.

The Big Melt

by Marjory Vin Williams

About a decade ago, as I hear the tale, a man by the name of Roger Angel charged off to a Tucson K-Mart and bought a bunch of Pyrex pie plates. He then proceeded to melt melt them. He was pleased with the result. On Saturday, January 18, 1997, he melted 41, 942 pounds of Pyrex-like glass to make the first of the two primary mirrors for the Large Binocular Telescope (LBT), a joint U. of A. / Arcetri Observatory project, being erected on Mount Graham.

Photo by Dean Ketelsen. Picture taken by Glen Nishimoto. Pictured left-to-right: Marjory Williams, Dean & Vickie Ketelsen, Regina Lawless, Marilyn Unruh, and Deborah & Mike Spooner.

If you have been to Pensacola, Florida, you found beach sand so white that natives regularly put it in the sugar bowls of unsuspecting visitors to enhance the point of the beauty and fineness of the sand. Off shore from these Florida beaches, sand is dredged and sent to the Ohara Glass Corporation in Japan and made into glass. The Steward Observatory Mirror Laboratory personnel believe Ohara does a finer job than Pyrex in making this borosilicate glass. By the time this glass, in big broken chunks, reaches the Mirror Lab, it costs $12.00 a pound, a little over $500,000 for this one mirror.

Why all this fuss over glass? Regular glass, when heated, will just sit there and slump. This special glass will run at relatively low temperatures. The maximum heat held for five hours (while the oven was spinning at 6.8 RPM) was 1180° centigrade, about four times hotter than your 500° oven: 2,156° Fahrenheit. Angel has designed a honeycomb form. Slumpy glass will not fill the form. Runny glass will. The whole casting process for this one mirror will take about 12 weeks. Then comes the delicate job of polishing. All this activity to support one ounce of aluminum.

Photo by Paul Dickson. The mirror is spinning is the background as the crowd gathers and talks.

The resulting mirror is 8.4 meters in diameter and would not fit into my 20x20 foot two-car garage since the mirror is 7 feet wider. The fact that it is in honeycomb

configuration means it can flex, cool down quickly, and won't collapse under it's own weight. It's also $f/1.14$. The glass blank is worth about $4,000,000 which will then be worth about $14,000,000 when polished.

The erection of the pier and and the lower portion of the LBT Observatory will be completed this year.

Paul Dickson, Regina Lawless, I and many others had a very enjoyable Saturday watching the melt-down at the Mirror Lab underneath the U. of A. football stadium. Dean and Vickie Ketelsen guided Regina, Marilyn Unruh (from Prescott), Deborah and Mike Spooner (from Page) and myself to a great Mexican meal at the Crossroads on 36th Street and 4th Avenue. If you attend one of these castings, don't miss the restaurant. We thank Dean also for hosting Regina and me during his busy day.

By the way, Roger Angel is also busy designing a new Hubble mirror.

LBT Mirror Update

by Paul Dickson

In early April, after nearly 3 months of cooling, the mirror finally dropped to room temperature. The LBT 8.4m mirror could finally be inspected up close.

When the mirror reach maximum temperature (1180° C) on the Sunday morning after the Open House, the surface level of the glass in the oven kept going lower and lower. It was decided then, to end the maximum temperature point early and begin cooling the mirror while there was still enough glass to grind the mirror's surface.

It turns out that the leaks of molten glass were worse than initially thought. Although 2 tons of glass was added against leaks, nearly 3 tons leaked out (out of a total of 11 tons of glass). This left portions of the 8.4m mirror's surface too thin to safely polish (areas around the mirror's perimeter.)

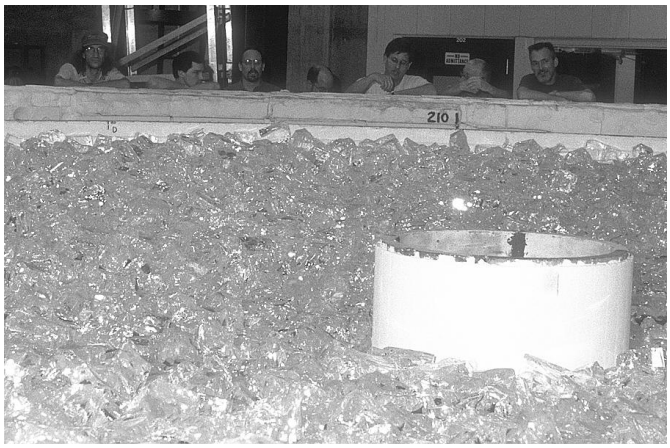


Photo by Dean Ketelsen. The mould was filled with 11 tons of glass. Each piece is roughly brick-like, in size, shape, and weight.

Since the grinding of the second 6.5m mirror has only recently been started, the LBT's 8.4m mirror doesn't need to be out of the mould until next spring. With this extra time available, time could be spent on fixing the mirror.

Fixing the mirror would entail recasting the mirror's surface. Extra glass would be added and the entire mirror would be reheated. The only difference from the first time, is that the honey-comb core would not be heated all the way to the maximum temperature. Only the mirror's surface would be heated fully. Thus, the glass in the core would remain viscous enough to prevent further leaks.

Photo by Paul Dickson. In the foreground is the mirror cell for holding the new MMT 6.5m mirror, which lies just above it in the photo. The second 6.5m mirror lies face-down on the grinding platform just above the first mirror. The back of the mirrors are ground to relieve stresses in the glass.

To prevent the core from being damage during the recasting, the mirror's temperature has to be ramped up slowly so internal stresses won't destroy the core. It will take several weeks to heat the mirror to the softening point of the glass (650 to 700° C).

After the softening point is nearly reached, the glass surface will be "flash" heated to 1180° to melt the new glass on to the mirror's surface. Then the mirror will be cooled again like the first time.

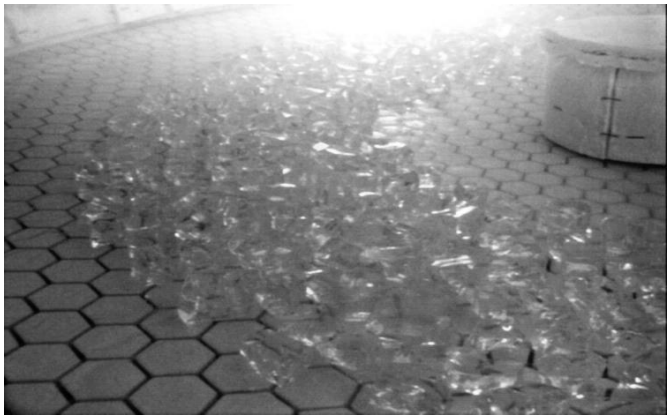


Photo from the Steward Observatory Mirror Lab Web Page. Two tons of new glass has been added and the mirror is being reheated once again.

This process has already begun. In last April/early May two tons of new glass was added to the mirror and the heating was started. Flashing heating should take place sometime in June.

See the Steward Observatory Mirror Lab Web Page for details and more current information:

http://medusa.as.arizona.edu/mlab/mlab.html

June 1997

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Grand Canyon Star Party June 7–14 See February SACNEWS for Details http://www.primenet.com/~dickson/sacnews.html **1**	**2**	**3**	**4**	New Moon 12:05 A.M. **5**	**TAAA Meeting** (Tucson) **6**	**7**
8	Wednesday **EVAC Meeting** (SCC: Rm. PS172) **9**	Date of Earliest Sunset for Phoenix **10**	**Astronomy Novice Meeting** **Thursday Evening, June 12** Steve Coe's Home **1011 E. Rowlands** **789–7786** **11** **12**		**13**	Thursday First Quarter Moon 9:52 P.M. **14**
15	**16**	**17**	**18**	Tomorrow Full Moon 12:11 P.M. **19**	**SAC Meeting** Grand Canyon University, Fleming Rm. 105 **20**	Summer Solstice 1:19 A.M. **21**
Yesterday Sun enters Gemini 4 A.M. **22**	**23**	**24**	Mercury at superior conjunction (moves into evening sky) **25**	Tomorrow Last Quarter Moon 12:52 A.M. **26**	NEAR flies by Asteroid Mathilde **27**	**SAC Star Party** Buckeye Hills (members&guests) **28**
29	Date of Latest Sunset for Phoenix **30**				All Times are Mountain Standard Time	

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.

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

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.

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

Stamp

First Class Mail

Inside: