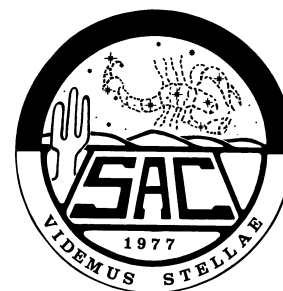


Saguaro Astronomy Club

Metro Phoenix, Arizona

SACNEWS



June 1994 — Issue #209

v3.30

The Secondary Obstruction: Atmosphere Resolution Threshold

by Rick Blakley

The following is an article Rick wrote on the response to an assertion he made at the August 6, 1993, meeting of the Tucson Amateur Astronomy Association (TAAA). The article originally appeared in the club's September issue of *Desert Skies*. This version of the article corrects a minor error resulting from misreading the crossing of two lines on the graph.

During my presentation near the end of the August 6 meeting, my assertion that the resolution of large reflectors is limited by the atmosphere rather than the obstruction of their secondaries was questioned, but the justification of such an assertion is easily made.

For example, presume two large aperture, **ideal** telescopes are situated under a sky offering no less than 1/2 arcsecond resolution. One telescope has a secondary of a diameter that restricts it to a minimum resolution of 1/4 arcsecond, and the other instrument is limited at 1/8 arcsecond by its secondary. Both instruments will resolve no better than 1/2 arcsecond that the sky offers, regardless of the obstructions of their secondaries. Of course, if both instruments' apertures were small enough that their secondaries worsened their resolving power to values greater than the sky's minimum, they both would perform at their worsened values, and would be said to be limited by their secondaries' obstructions. These examples imply that a threshold value exists between the extremes given here where the resolution limit of the atmosphere is match by the resolution allowed by the instrument's secondary obstruction.

We can pursue this more systematically using the contrast transfer curve, but we must become familiar with

Quick Calendar

SAC Star Party
Buckeye Hills Recreation Area
Saturday, June 4

Grand Canyon Star Party
June 4-11

SAC Meeting
Show-'N'-Tell Night
7:30, Friday, June 24

Universe '94
June 25 & 26

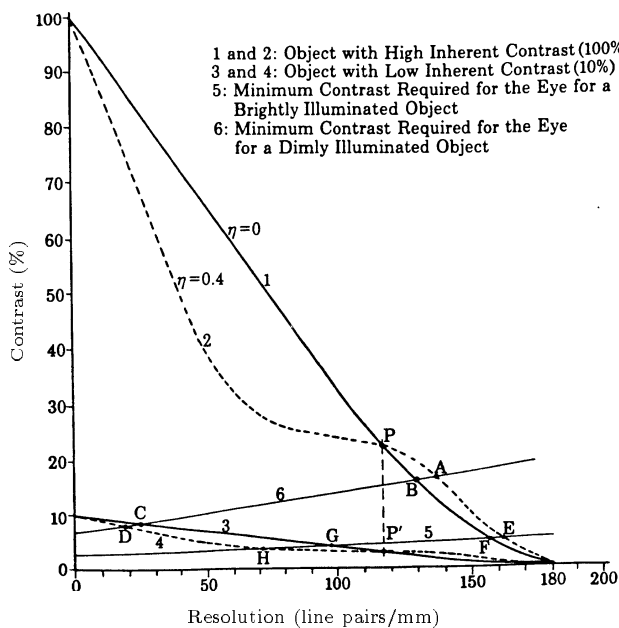
some concepts first. Let us presume that we are observing special targets with alternating dark and light parallel lines. The local brightness of a bar is a function of the sine of the bar's position so that the bars fade in and out as one proceeds down the target perpendicular to the bars. The "spatial frequency" of the bars is merely the counted number of bar (or line) pairs per millimeter. We must also define "contrast", and we will call it the difference in intensities of adjacent light and dark bars divided by the sum of the same intensities. Assuming the brightest equal 100 and the darkest equals zero, $100 - 0$ divided by $100 + 0$ gives 1 for the contrast. An optical system will diminish contrast as the light from a target travels through the system, so we can not expect to get a 1 at our focus (the lighter part gets darker and the darker parts get lighter). In fact, if we divide the contrast value we get at the focus by our starting value for the target, we get "contrast transfer." While scattered reflections, diffraction from mirror or lens edges and secondary obstructions, aberrations, and other things enter to reduce

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contrast transfer, we will consider contrast transfer only from the effect of the secondary obstruction in this article.

Our procedure entails measuring or calculating the contrast transfer for a given obscured aperture for various targets having differing spatial frequencies, and plotting the results. Fortunately, Rutten and van Venrooij have done this for us for an aperture with a 40% obscuration on page 215 of their book *Telescope Optics* (Willmann-Bell, 1988), and we will use their graph,



printed by permission. The contrast transfer is noted in percent on the left vertical axis of the graph, and the spatial frequencies of the targets observed are located on the bottom horizontal axis, noted as “resolution” in line pairs per millimeter. Note the ski-slope curve no. 1 for the unobscured aperture and the humpy curve no. 2 for

the system with a 40% obstruction beginning with 100% contrast transfer at the extreme left.

That spatial frequency is equated with resolution is significant; an optical system will resolve the various spatial frequencies up to a maximum (which is 180 line pairs/mm for this case) found by calculating

$$\frac{\text{linepairs}}{\text{mm}} = \frac{1}{w \times f/\text{no.}} \quad (\text{A})$$

where w is the wavelength of light used in the observation and $f/\text{no.}$ is the aperture ratio. Neither aperture nor focal length appear alone in the calculation. We can use the graph for any system with the $f/\text{no.}$ considered here, which the authors indicate is $f/10$ (actually one can calculate Eq. A for another $f/\text{no.}$ and rescale the horizontal “resolution” axis). If the resolution axis is to be read in arcseconds, we use the equation

$$r = \frac{206265}{[f \times (\text{lp}/\text{mm})]} \quad (\text{B})$$

where f is the focal length of our telescope (in millimeters) and lp/mm is the line pairs per millimeter on the resolution axis.

Let us now look at the graph, but let us consider a contrast transfer of 10%, a value appropriate for planetary viewing. This corresponds to line no. 4 for the 40% also consider the contrast response of the eye on the graph for bright, low contrast objects like planets, line no. 5. Notice lines 4 and 5 cross at about 72 lp/mm at point H. Let us assume that we are observing with an $f/10$, 5730mm focal-length system. We find that 72 lp/mm corresponds to 1/2 arcsecond.

Now, we know that we cannot resolve any better than what the atmosphere will allow us unless we use special
Continued on page 4...

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.

1994 SAC Meetings

Jan. 28
Feb. 25
Mar. 25
Apr. 22
May 20
Jun. 24
Jul. 22
Aug. 19
Sep. 16
Oct. 21
Nov. 18
Dec. 17 Party

1994 SAC Star Parties

Date	Sunset	Moonrise
Jan. 8	5:38pm	5:22am
Feb. 5	6:05pm	4:11am
Mar. 5	6:29pm	2:58am
Apr. 9	6:55pm	5:42am
May 7	7:16pm	4:17am
Jun. 4	7:34pm	2:52am
Jul. 2	7:42pm	1:27am
Aug. 6	7:24pm	6:09am
Sep. 3	6:51pm	4:56am
Oct. 1	6:14pm	3:40am
Oct. 29	5:40pm	2:24am
Nov. 26	5:22pm	1:12am

Comet Comments

by Don Machholz

(916) 346-8963 CC190.TXT May 7, 1994

Many Comets are visible in our skies with two bright ones found.

Periodic Comet Russell 2 (1994e): Recovered by J. Scotti of Kitt Peak on Apr. 5, it will remain faint. The orbital period is 7.4 years.

Takamizawa-Levy (1994f): Kesao Takamizawa of Japan photographed this comet in the morning sky at magnitude ten, David Levy of Tucson, Arizona picked it up visually a few hours later. Perihelion was May 22 at 1.35 AU.

Periodic Comet Harrington (1994g): J. Scotti recovered this comet on May 1 at magnitude 18. It has a 6.7

year orbit and will not brighten much.

Periodic Comet Maury (1994h): J. Scotti recovered this comet at mag. 18.

Comet Takamizawa (1994i): Takamizawa picked up this one near opposition. It will be closest to the sun on July 8 at 1.88 AU.

Comet	Takamizawa-Levy		(1994f)		
Date	RA-2000-Dec	Elong	Sky	Mag	
05-23	19h39.3m	+57° 04'	90°	M	8.8
05-28	18h30.4m	+65° 24'	90°	M	8.9
06-02	16h42.4m	+69° 57'	88°	M	9.0
06-07	14h48.3m	+69° 16'	85°	E	9.1
06-12	13h30.9m	+65° 20'	81°	E	9.4
06-17	12h46.3m	+60° 33'	77°	E	9.6
06-22	12h19.9m	+55° 59'	73°	E	9.9
06-27	12h03.4m	+51° 55'	69°	E	10.2
07-02	11h52.7m	+48° 23'	65°	E	10.4
07-07	11h45.5m	+45° 19'	61°	E	10.7

Periodic	Comet	Tempel			1
Date	RA-2000-Dec	Elong	Sky	Mag	
05-23	12h57.6m	+05° 40'	128°	E	9.0
05-28	12h59.0m	+04° 00'	125°	E	8.9
06-02	13h01.7m	+02° 15'	122°	E	8.9
06-07	13h05.3m	+00° 23'	119°	E	8.9
06-12	13h10.1m	-01° 32'	116°	E	8.9
06-17	13h15.8m	-03° 30'	113°	E	8.9
06-22	13h22.5m	-05° 31'	111°	E	8.9
06-27	13h30.0m	-07° 32'	108°	E	8.9
07-02	13h38.4m	-09° 33'	106°	E	9.0
07-07	13h47.6m	-11° 33'	104°	E	9.1

Period	Comet	Mueller			(1993a)
Date	RA-2000-Dec	Elong	Sky	Mag	
05-23	23h10.7m	-11° 31'	78°	M	10.5
05-28	23h10.3m	-13° 14'	83°	M	10.5
06-02	23h09.3m	-15° 06'	89°	M	10.5
06-07	23h07.6m	-17° 09'	95°	M	10.5
06-12	23h05.0m	-19° 21'	101°	M	10.5
06-17	23h01.6m	-21° 44'	107°	M	10.5
06-22	22h57.1m	-24° 17'	113°	M	10.5
06-27	22h51.4m	-26° 59'	120°	M	10.5
07-02	22h44.8m	-29° 47'	126°	M	10.6
07-07	22h36.7m	-32° 40'	132°	M	10.6

Comet	Takamizawa		(1993i)		
Date	RA-2000-Dec	Elong	Sky	Mag	
05-23	15h19.8m	-08° 44'	165°	M	9.9
05-28	14h43.2m	-09° 54'	154°	M	9.9
06-02	14h09.0m	-10° 51'	142°	M	10.0
06-07	13h38.9m	-11° 34'	131°	M	10.1
06-12	13h13.3m	-12° 08'	121°	M	10.2
06-17	12h52.2m	-12° 34'	111°	M	10.3
06-22	12h35.2m	-12° 57'	103°	M	10.5
06-27	12h21.4m	-13° 19'	95°	M	10.7
07-02	12h10.4m	-13° 40'	88°	M	10.8
07-07	12h01.6m	-14° 02'	82°	M	11.0

Periodic	Comet	Shoemaker-Levy 9			(1993e)
Date	RA-2000-Dec	Elong	Sky	Mag	
05-23	14h14.4m	-13° 31'	154°	E	13.6
05-28	14h12.8m	-13° 19'	149°	E	13.6
06-02	14h11.4m	-13° 08'	144°	E	13.6
06-07	14h10.3m	-12° 57'	139°	E	13.6
06-12	14h09.4m	-12° 49'	134°	E	13.6
06-17	14h08.8m	-12° 41'	129°	E	13.7
06-22	14h08.6m	-12° 35'	124°	E	13.7
06-27	14h08.6m	-12° 30'	119°	E	13.7
07-02	14h09.0m	-12° 26'	114°	E	13.7
07-07	14h09.6m	-12° 24'	110°	E	13.7

Comet	McNaught-Russell		(1993v)		
Date	RA-2000-Dec	Elong	Sky	Mag	
05-23	12h31.6m	+74° 37'	79°	E	9.5
05-28	13h09.0m	+72° 43'	81°	E	9.9
06-02	13h37.0m	+70° 36'	82°	E	10.2
06-07	13h58.6m	+68° 22'	83°	E	10.5
06-12	14h15.9m	+66° 03'	69°	E	10.8
06-17	14h30.2m	+63° 44'	71°	E	11.1
06-22	14h42.4m	+61° 23'	73°	E	11.4
06-27	14h53.1m	+59° 02'	75°	E	11.7
07-02	15h02.8m	+56° 43'	77°	E	11.9
07-07	15h11.7m	+54° 24'	78°	E	12.2

Period	Comet	Mueller			(1993p)
Date	RA-2000-Dec	Elong	Sky	Mag	
05-23	08h43.2m	-28° 46'	85°	E	7.9
05-28	09h10.8m	-23° 31'	84°	E	8.3
06-02	09h33.1m	-18° 58'	82°	E	8.7
06-07	09h51.5m	-15° 09'	81°	E	9.0
06-12	10h07.1m	-11° 59'	78°	E	9.4
06-17	10h20.6m	-09° 22'	76°	E	9.7
06-22	10h32.4m	-07° 13'	73°	E	10.1
06-27	10h43.1m	-05° 69'	70°	E	10.4
07-02	10h52.8m	-03° 57'	67°	E	10.7
07-07	11h01.8m	-02° 43'	63°	E	11.0

A Small Error Corrected

by M. Leon Knott

techniques such as speckle imaging (which in any case is only good on stars) or active optics, which we are not equipped to use as amateurs. For our 5730mm focal-length system, a resolution of 1/2 arcsecond equates to the 72 lp/mm, as we have already calculated. This suggests that 730mm **IS** the **IDEAL** 1/2 arcsecond threshold aperture for 40% obstructed systems used visually. If we rescale the horizontal resolution axis for an $f/8$ system, and do the same calculation for 1/2 arcsecond resolution, we find that we would get the same 573mm aperture. This occurs because the resolution axis is scaled using the $f/\text{no.}$ in the relation $1/[w(f/\text{no.})]$ and we divide through by the focal length to get the resolution axis to read in arcseconds.

Let us presume that our instrument is $f/10$ but has an aperture of only 508mm. Transposing Eq. B to

$$\text{lp/mm} = \frac{206265}{[f \times r]} \quad (\text{C})$$

we get that 1/2 arcsecond is equivalent to 81 lp/mm. This value is to the right of the intersection of lines 4 and 5 at H on the graph. The secondary, therefore, limits this instrument at a resolution more coarse than allowed by the atmosphere's 1/2 arcsecond for a 10% contrast transfer value. The actual resolution allowed by the secondary at 10% contrast transfer is 0.56 arcseconds.

Let us again make a presumption, but this time the instrument has an aperture of 762mm at $f/10$. We calculate that a 1/2 arcsecond sky allows 54 lp/mm in the focal plane of the telescope. This value is to the left of the intersection of lines 4 and 5 at H on the graph. The minimum resolution of the instrument due to the 40% obstruction of the secondary is the 72 lp/mm at H which equals 0.38 arcseconds. Clearly, the sky limits this instrument at 10% contrast transfer.

The same techniques can be used for evaluating the performance for various instruments relative to other eye-instrument intersecting lines on the graph (at 4 & 6 or 2 & 6, for example). Other values for resolution allowed relative to the sky can be accounted for as well for other secondary-obstruction percentages if one is willing to plot the various eye-lines from the graph used in this articles on the graph of figure 18.7 on page 213 of *Telescope Optics*. But one should take care not to interpret the results too literally. Other factors that are not considered here play a roll, and so one should allow a hefty fudge factor before building. One may choose to allow a 35% obstruction for a 573mm aperture system rather than 40% we presumed here, perhaps.

Figure from *Telescope Optics: Evaluation & Design* by Harrie Rutten & Martin van Venrooij, Copyright 1988 by Willmann-Bell, Inc. Reproduced by written permission.

Newsletter Deadline

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

In the May 1994 issue of the SAC newsletter (an exquisite newsletter by the way), a typographical error is made when listing the participants of the 1994 Messier Marathon. I am listed as having done the marathon with a pair of 10x25 binoculars. In fact, my instrument of choice is a pair of 25x100 binoculars.

Actually, I shouldn't note or complain about such an insignificant error but for a couple of reasons. In the first place, I have very serious doubts that 107 Messier objects can be seen in binoculars with an objective diameter of 25 millimeters which, as you know, is awfully close to one inch. Beginners should be aware that the finding of deep sky objects does require some fairly substantial objective diameter. Furthermore, in my limited experience, I find that increasing the magnification of binoculars has more to do with making dim and small objects visible than do small increases in aperture. In short, the planetary nebula known as M 76 is so tiny that a magnification of 10x will not make it evident. It might appear, if seen at all, as a small star. At 25x however, it is abundantly nebulous and cannot be easily mistaken for a star. The same can be said for NGC 6781, the Saturn, the Eskimo, Jupiter's Ghost and numerous other planetaries.

My second reason for "setting the record straight" is a personal conviction that we should adhere very strongly to a code of "truth in observing." To be even more frank, I would have serious doubts if ANY observer claimed to see the 107 objects in such a small pair of binoculars and I certainly know that I could not.

Such concerns might seem trifling, but I believe that one's credibility as an observer is important. Some objects are difficult to see and beginners should be made aware that many observations can be successfully made only after years of experience and practice.

Of course, the frontiers of deep sky observing are being pushed back all the time. And SAC's experts are certainly helping lead the way in this advance. But I can't help but feel that even these observers would want their observations presented in a credible fashion.

On the other hand, let me offer big binoculars as an excellent choice for deep sky observing. In using mine for the last couple of years, I've found them ever-surprising in their revelations. Big binoculars are especially fine for observing galaxies, dark nebulae, globulars and a whole host of deep sky objects. Of course, they aren't adequate for resolving tiny details in galaxies, or for observing planets and so on.

But wait a moment...The super-close-up view of a galaxy, with the knots of nebulosity, dust lanes, H-2 regions and so on, is awesome. However, there is another view that rivals it. That view is of the forest itself, not

What's Up

by Steve Coe

June 1994

Scorpius

I had a chat with Paul Dickson at the last Saguaro Astronomy Club meeting and he said there was room in the newsletter if I wished to start a regular column again. A column with this name and my by-line ran for about 5 years and then I decided to take a break for a while. Now, it seems a good time to begin again.

So, let's start anew with the first constellation I definitely remember learning as a Boy Scout. That is the obvious star picture of Scorpius. This beautiful curved chain of stars does remind me of a scorpion and signals the beginning of Summer each time I see the red star Antares snaking its way above the southeastern horizon. I am obviously not alone in this mental image, the ancient Chinese installed the Azure Dragon at this location in the sky. A wise and benevolent reminder of the whole of Creation, this certainly is an excellent place to begin reviewing what can be seen in the night sky.

M 4 is one of the most beautiful objects in the sky and one of my Top 100 for many years. This huge globular cluster is visually at least 15 arc minutes in size using my 13" at 100X. Its magnitude is given as 7.4 in Burnham's, but at a dark site like Sentinel I can just see a dim glow about one degree west of Antares. Raising the power to 200X brings out lots of beautiful chains of stars which curve out from a bright central bar. This bar can even be seen in the finderscope as an

elongated brightening in the middle of this magnificent cluster of stars.

Antares is a rather difficult double star. If all you saw in the statistics was the fact that the separation was 3 arc seconds and the companion was 6.5 magnitude you might not think this double star would be tough to split. However, seeing a close companion to a first magnitude star is no easy task. This star seems to show off its dual nature better during twilight. I believe the brighter background doesn't let the bright star dazzle your eye. Also, Pierre Schwaar and I have both noticed that the seeing is better during twilight in Arizona. Trying to use my old 17.5" Dobsonian at full aperture was too much, so I stopped it down to 10" and got a fine view and clean split on several occasions over the years, usually at about 200X. My 13" has no trouble showing dark sky between these stars on a steady night at 220X. Now, as to the color of the companion, much has been written, some by me. I have always seen the companion to Antares as light green. This could be a contrast effect, since Antares is so obviously orange.

NGC 6144 is a very nice compact globular cluster, also near Antares. I see it as pretty bright, large, compressed and somewhat brighter in the middle at 135X. The surface of this cluster is very mottled with stars just at the edge of resolution at 200X and I can resolve 12 stars on a good night at Dugas Road. This cluster is at the edge of a very dark nebula, it is as if the stars from one area were gathered up and lumped together.

So, that finishes the new beginning of What's Up. If you have a favorite object that you think needs to appear in print, invite me to your scope for a peek. I am always ready to have a look at a new object or a great view of an old favorite.

of just one tree. That view helps us to see a galaxy's juxtaposition with other galaxies, with planetary nebulae or globular clusters lying in the foreground. Such a wide field view helps us to feel our own galaxy's position and likeness as well.

I will certainly continue using big telescopes and high powers. But you can bet those big binos will be there as well.

Sensational Sentinel

by Steve Coe

The Sentinel Star Gaze for 1994 was a success in every way. This observing get-together is sponsored by the Deep Sky Group of the Saguaro Astronomy Club. It is held two miles south of the tiny town of Sentinel which is about 100 miles from metropolitan Phoenix, AZ. Even though the "official" star party was on Saturday, May 7, a

group of anxious observers gathered on the Friday night to double their pleasure. The SAC members included: Tom Polakis, A.J. Crayon, Jim Stevens, Pierre Schwaar, Bernie Sanden, Dick Jacobsen, Frank Martin and Gus Van Noy (if I have missed someone, I apologize.) Several out-of-town observers showed up to join in the fun. In increasing distance traveled they are: Bob Erdmann from Sun City and the publisher of the Arizona Database Project; Kevin Gill from Cave Creek and a very active member of the AstroForum on Compuserve; Bob Kepple and Glen Sanner, who distribute Astro Cards and had traveled from Pennsylvania to spend some time in Arizona and then drive to the annular eclipse and Texas Star Party; and the winner for log distance travel were three gentlemen from Belgium! Peter Kreutz and his two companions: Jean-Luc and Henry (I didn't get last names) are also going to the eclipse and read a message I posted on Compuserve, so they added Sentinel to their plans.

The Friday night was quite good and I settled on a rating of 7/10 for transparency and 5/10 for seeing. A few clouds drifted through, but it was generally a very

clear evening. As I made my way around the observing area I got views of Omega Centauri in Jim Steven's 17.5" with a binocular viewer setup, Frank Martin's 17.7" gave an excellent view of M 5 in Serpens and Pierre Schwaar's 8" binocular chair was continuously occupied by someone scanning the Milky Way in comfort. My 13" showed that the supernova in M 51 had faded considerably to magnitude 15. Just before going to sleep, I got a chance to use Gus's Genesis to scan the Milky Way at low power and follow looping dark lanes leading to heaps of stars in clusters. All-in-all a very nice night.

The sun woke most everyone by 9:00 AM or so (far too early) and we stumbled about putting together breakfast and trying to wake up. As the day passed and conversation moved from subject to subject, we also found that we needed to move the tarp which covered the conversation area to shade the group from the Arizona Sun. Most folks tried to get a nap in preparation for the second night. As the shadows got longer, more people and telescopes pulled into the site. By twilight, I walked around the area and counted 40 telescopes. Newcomers included: Rich Walker, Rick Rotrammel, Rick Nadolny, Tom McGrath, Bob Gardner, Paul Lind, Ethan Rauch, David and Lika Romney, Dick Simmon, Brian Vorndam and Paul Dickson. Again, if I have forgotten any of the club members who showed up, please forgive me.

As the sky rapidly darkened and Venus in the west and Jupiter in the east became very prominent, a bright meteor streaked across the sky for 90 degrees through Hercules and Serpens, southward toward Jupiter. The meteor was -6 magnitude and dimmed and then brightened again before burning out 10 degrees short of Jupiter. It was a spectacular start to a spectacular night of observing. I realized what a great night it was going to be when I put

the 13" on M 108 and M 97 in Ursa Major. The galaxy was bright, very elongated and extremely mottled across the entire length at 150X. Going to the Owl Nebula at 330X showed the dark "eyes" easily and several stars involved within the nebula. As Glen Sanner and I were observing this, the Mir space station crested the north-west horizon and brightened to first magnitude, then as it approached the handle of the Big Dipper, it disappeared into the Earth's shadow within 5 degrees of movement. It was fascinating to watch a bright object go dimmer and fade completely in so short a period of time.

The western sky was now dark enough to look for Comet McNaught-Russell and it was about 10th magnitude with a condensed core at 150X, even though no tail was seen, the coma was still bright and 5 arc minutes in size. We moved on to the CBS Eye Nebula (NGC 3242 in Hydra.) The seeing was excellent and so we tried 440X and the detail within the nebula was easily seen. It really does appear like the TV logo, with the central star inside the "pupil" of the eye. Glen and I also tested the magnitude limits of the scope by trying the Corona Borealis Galaxy Cluster. The brightest galaxies are 15.5 magnitude with most at 17 or dimmer. However, the 13" showed us two low contrast, elongated galaxies within a very mottled area at 220X. Once the Milky Way rose high enough, Comet Takamizawa-Levy could be seen at 9th magnitude cruising between the loops of the Veil Nebula. Using a wide angle eyepiece the comet and NGC 6992 just fit into a one degree field, a unique observation for me. To maintain a record of how good the evening appeared, I rated the seeing 8/10 and the transparency at 9/10, as good as Sentinel gets in the 12 years that SAC members have been using this site.

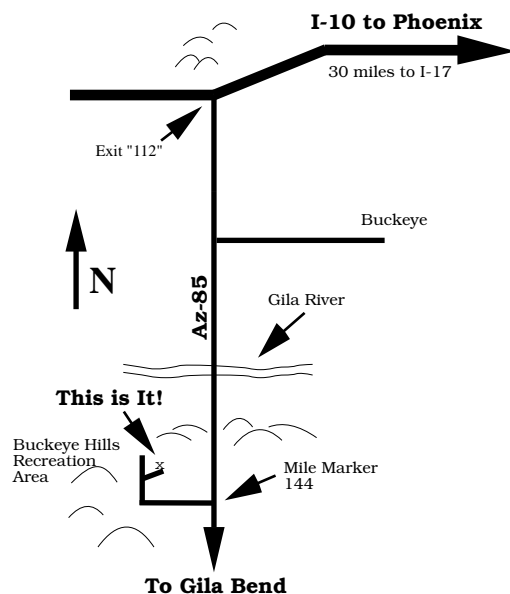
A walk around the observing field brought you in con-

Directions to SAC Events

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

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

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



tact with folks looking at a wide variety of astronomical objects. Dark lanes in Centaurus A and NGC 4565 are seen, the cores of a wide variety of globular clusters are resolved, double star colors are discussed, the red color of V Hydrae is faint but easy seen and the binocular chair continues to scan our galaxy with a hypnotized rider on board.

All too soon the sky brightens toward the east and this great night of observing is over. One last look at an old favorite and then I collapse into the back of the truck to dream of what I have observed while it was dark.

Again the sun rousts groggy astronomers far too early and preparations begin to return to civilization. Scopes are broken down, warm clothes packed, eyepieces put away and a short breakfast eaten. I think we also checked the binocular chair to see if one of Belgians was still onboard trying for one last look at the Lagoon.

Bits and Pieces

Coming Events

Star Parties

Universe '94	Jun. 25 & 26
Grand Canyon	Jun. 4-11
Shoemaker-Levy 9	Jul. 16-22
Perseids	Aug. 12
All-Arizona	Oct. 7 & 8

June SAC Meeting

There will be no main speaker for the June meeting. Instead the meeting will be a time for members to show the club what they've been up to. If you want to make a short presentation, sign up just prior to the start of the meeting. Please try to keep your presentations within 20 minutes.

Deep Sky Meeting

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

The next group of objects to discuss from the 110 Best NGC List will be 24 objects in the constellations Coma Berenices, Canes Venatici, and Virgo. Eventually we will discuss the entire 110 Deep Sky objects in the listing.

The following spring time galaxies are to be discussed:
Coma Berenices: 4274, 4414, 4494, 4559, 4565, 4725.
Canes Venatici: 4111, 4214, 4244, 4449, 4490, 4631, 4656, 5005, 5033. Virgo: 4216, 4388, 4438, 4526, 4535, 4567, 4699, 4762, 5746.

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

The Deep Sky meeting will take place on Thursday, June 2 at 7:30pm.

Universe '94

The year's biggest astronomy product show — Universe '94 — will take place Saturday and Sunday, June 25-26 at NAU in Flagstaff. If you'd like to attend, pick up an application at the SAC meeting or contact the SACNEWS editor.

Grand Canyon Star Party

During the week of June 4-11 the Grand Canyon Star Party, sponsored by the Tucson Amateur Astronomy Association (TAAA), will take place. In the past, SAC has made a poor showing at this star party. Although this star party extends more than a week in length, it is not necessary to attend the whole event. If only one night is all you can manage, that's O.K. If more, that's O.K. too. The point is SAC should have some attendance, Phoenix is a two hour drive closer to the Grand Canyon than Tucson.

At this late date, if you don't already have reservations, you are unlikely to get them at the canyon. Your best bet might be to go for one night or stay in Flagstaff one or more nights. The star party will be similar to a public star party at first. But after the crowds leave, serious observing can begin under the canyon's dark skies.

Here is some information in case you feel lucky and want to try for a cancellation:

Housing: For reservations at any of the motels or lodges at the South Rim or for Trailer Village (Camping trailers or RV's) call Fred Harvey Inc. at (602) 638-2401. Expect long telephone waits while making your reservations. If you can tolerate a 7 mile drive, you can also try the following motels at Tusayan (all area code 602): Squire Inn 638-3515, Moqui Lodge 638-2424, Quality Inn 638-2673, Red Feather Inn 638-2414, 7 Mile Lodge 638-2291. **Camping:** To make reservations for campsites at the regular rates (\$10 per night,) call MISTIX at 1-800-365-2267, no more than 8 weeks ahead.

For questions concerning the Grand Canyon Star Party, please call or write to **Dean Ketelsen** at: **1122 E. Greenlee Pl., Tucson, AZ, 85719**, home phone **(602) 293-2855** or E-mail to ketelsen@as.arizona.edu.

Minutes of the April Meeting

The President called the meeting to order at 7:30pm.

The President indicated that there two speakers for the next meeting and to accommodate them there would be no Show-and-Tell.

Following the Treasurer's report Rich Walker discussed Public Viewing sessions. REACH 11 had about 15 scopes, one scope farm and about 100 people. The

Peru or Bust!

Pierre Schwaar

265-5533

You can help me get to Tacna, Peru, to record next November's solar eclipse. In exchange, I will present you with a BIG 16x20 color enlargement of my best eclipse shot and a VHS copy of Hi8 video, all taken with a specially modified 6" *f*/5 telescope. All you have to do is make a purchase of \$200 or more of one of my products, now until Oct 1, 1994.

Available immediately are the following items:

Complete Telescopes:

6" <i>f</i> /3.9 RFT	\$350
6" <i>f</i> /6.1 Dobs	\$375

Mirrors (includes diagonal):

6" <i>f</i> /5.2 (4ea)	\$200ea
8" <i>f</i> /5.2 (2ea)	\$300ea
10" <i>f</i> /5.5 (1ea)	\$425

next session is May 14 at Thunderbird Park. There were requests for smaller sessions at South Mountain Park for May 6 and Glendale Christian Academy for May 17. See Rich if you want to participate in one of the last two.

A.J. Crayon made some announcements about upcoming events. One of the announcements was a dinner with Brenda Branchett and family on Thursday, May 5, at Pinnacle Peak Restaurant. We should gather there for 7:00 PM. Brenda is the Herschel 400 Coordinator for the Astronomical League. The other major item was the presentation of the Messier Marathon Awards. See last months Newsletter for particulars. Awardees not present should see A.J. to retrieve their awards.

Steve Coe discussed the upcoming Sentinel Star Gaze, see map for details. Gene Lucas discussed the Riverside Telescope Makers Conference. Paul Dickson made an appeal for people to attend the Universe '94 conference at Flagstaff, AZ.

To complete the announcements the Vice President announced the two speakers for next meeting.

For the first Show-and-Tell Rick Rotramel show some

slides of the November Lunar eclipse, and a video of the February SAC Star Party and the REACH 11 Public Star Party.

Pierre's Show-and-Tell was a video, what else did you expect, showing his attempts of detecting a very young moon, the youngest of which was 26 hours. He also showed his simulations of solar eclipse experiments using a bowling ball atop his back yard shed. His final display was a view of the Russian Mir Satellite.

After a 10 minute break the meeting was reconvened and Vice President Susan Morse introduced the speaker. He was Dr. Paul Comba, President of the Prescott Astronomy Club. His talk was titled "Asteroids — 1000 Minor Planets" and was thoroughly enjoyed by all. He ended the talk with some impressive deep sky photographs.

After the meeting was closed we adjourned to a local restaurant to nourish ourselves so we could continue our discussions.

—A.J. Crayon, SAC Secretary

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.

For Sale—Meade 10" *f*/6 mirror, \$250 OBO. Also included, the remaining parts of this unfinished telescope project, if interested. Please call 957-1250, 7 AM til 6 PM leave a message. After 6 PM ask Adrian.

June

1994

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> All Times are Mountain Standard Time </div>			1	PAS Meeting 2	TAAA Meeting 3	SAC Star Party Buckeye Hills (members&guests) 4
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> Grand Canyon Star Party June 4-11 </div>			8	New Moon 1:26 A.M. 9	Mercury 3°N of Moon 5 P.M. 10	11
5	6	7	8	9	10	11
12	13	14	15	First Quarter Moon 12:56 P.M. 16	17	18
Jupiter 3°N of Moon 9 A.M. 19	20	21	EVAC Meeting 22	Full Moon 4:33 A.M. 23	SAC Meeting 24	Mercury at inferior conjunction 3 A.M. 25
26	27	28	29	Last Quarter Moon 12:31 P.M. 30		

Magazines & Discounts

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

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

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

Publishing at (800) 253-0245.

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

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

Saguaro Astronomy Club Member Services Form

Membership

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

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

Subscriptions

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

Sky & Telescope.....\$20.00 for one year

Astronomy.....\$18.00 for one year

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

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

Carol Lee
SAC Treasurer
3314 N 68th Street, #205-W
Scottsdale AZ 85251



SACNEWS

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

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