

East Valley Astronomy Club

March

Newsletter

1997

EVAC MEETING HIGHLIGHTS

by Aaron McNeely

President Sheri Cahn began the meeting at 7:30 pm. There were 71 persons present, 61 members and 10 guests. Sheri discussed the following events:

Local Star Party: March 1 at Florence Junction.

Messier Marathon: March 8 at Arizona City.

EVAC Meeting: March 12 at SCC.

Sam Herchak (ph. 924-5981) is arranging the EVAC Picnic-Cookout. Everyone is to meet on March 29th, the date of the Local Star Party, at the Lost Dutchman State Park. The Cookout begins at 3:00 pm and will run till midnight. We have the group ramada in the Cholla picnic area reserved. Sam will take care of hamburgers, hot dogs, buns, condiments, baked beans, and potato salad. We need volunteers for sodas, treats, etc. Contrary to what you may have heard at the meeting, there will be no charge for attendance.

As of the February EVAC meeting we were still negotiating a site for the Hale-Bopp Public Star Party and are considering Utery State Park. Wherever it is held, the event will go from 6-10 pm on Sunday, March 23. This evening will be memorable because of a near-total eclipse of the Moon, Mars at opposition, and the apparition of Comet Hale-Bopp.

Astronomy Day is on April 12 this year. EVAC hosts a public star party for Astronomy Day at the Scottsdale Community College each year. We do this mainly in exchange for the use of our meeting room. Volunteers are needed for this event.

Steve Coe from the Saguaro Astronomy Club provided information on SAC activities. The Messier Marathon will take place on March 8 at the Arizona City site. The Messier Marathon will stand in for EVAC's Deep Sky Star Party. On March 23, SAC is hosting an "Astro Spectacular" public star party. The Sentinel Star Gaze will be on April 5 in Sentinel and will be a "2 nighter." For their 20th anniversary, SAC is holding a banquet to celebrate. Tickets are \$20 per person, and they are renting out a large banquet hall for this. SAC is also

involved with a travel agency promoting an eclipse cruise aboard the Dawn Princess for the February 28, 1998 total eclipse in the Caribbean. The Dawn Princess will be a brand new ship. If you have any questions about these events contact Steve at 74040.2071@compuserve.com.

Adopt-A-Highway - Sign up with Sam/Silvio if you are interested in contributing to EVAC and society. The clean up will be on April 19. It shouldn't be too bad because last year's group removed the worst of the trash. This event provides an opportunity to witness what the Arizona sun does to various types of objects.

The All-Arizona Star Party will be on October 4. For more info see the Board of Directors Meeting Minutes.

Talk to Silvio if you want an EVAC name tag. For more info see the Board of Directors Meeting Minutes.

Ken Spruell passed out a Questionnaire for members that attended the meeting. The intent of the questionnaire is to help the Board of Directors to better understand the members interests and needs. The results of the questionnaire will be published in the newsletter at a later date. The questions were about telescope and binoculars owned, usage of the Club's viewing sites, willingness to volunteer time for Club activities, and preferences for EVAC speakers. Ken has also obtained a free copying machine for the newsletter.

UPCOMING EVENTS

- **Messier Marathon, Mar. 8, Sunset - 6:30 pm**
See article in this Newsletter
- **EVAC Club Meeting, Mar. 12, 7:30 pm**
SCC, Physical Science Bldg., Room 172
- **Hale-Bopp Public Party, Mar 23,**
Contact Tom Polakis for details
- **EVAC Cookout and Star Party, Mar 29,**
3:00 pm - See Meeting Highlights for details
- **Sentinel Star Party, Apr. 5, Sunset - 6:51 pm**
Contact club officers for details
- **EVAC Club Meeting, Apr. 9, 7:30 pm**
SCC, Physical Science Bldg., Room 172

**EVAC Board of Directors Meeting
January 30, 1997**
by Aaron McNeely - EVAC Secretary

Attendees: Sheri Cahn, Frank Honer, Silvio Jaconelli, Bob Kearney, Jr., Robert Kerwin, Aaron McNeely, Tom Polakis, Bernie Sanden, Ken Spruell, and Don Wrigley.

Tom Polakis hosted the meeting, and it was called to order at a little past 7:00 pm.

Old Business

Picnic-Cookout: Sam Herchak, who could not attend the meeting, offered to organize this event and suggested that it take the place of the March Local Star Party. As of the Board Meeting it was undecided as to where the picnic would take place and we decided to consult Sam about this. We considered the Lost Dutchman State Park and the Boyce Thompson Arboretum.

Astronomy Day Public Star Party: The Astronomy Day Public SP will take place at the Scottsdale Community College on Saturday, April 12 and will take the place of the April Local Star Party. Sheri Cahn will not be able to attend, and volunteers will be needed for this event.

Hale-Bopp Public Star Party: The Hale-Bopp Public SP is scheduled for Sunday, March 23. This evening will be memorable because of a near-total eclipse of the Moon, Mars at opposition, and the apparition of Comet Hale Bopp. Places suggested for this event were the Lost Dutchman SP, Papago Buttes, or the Boyce Thompson Arboretum. The Board decided to await decision upon the location until a later time.

Arizona Science Center Opening Event: The Arizona Science Center, located in downtown Phoenix, is adding a new planetarium to its repertoire of science exhibits. Since Phoenix lacks a state of the art planetarium facility, this is a welcome addition. EVAC has communicated with the Science Center concerning a tentative opening night observing session on April 12, and the Board decided to await decision upon this matter until a later time.

Adopt-A-Highway Clean-up Day: This will be on April 19, a Saturday between other EVAC scheduled events. Volunteers are needed for this, and the work will be easier due to last year's efforts.

All-Arizona Star Party: The All-AZ SP will take place on October 4. Sheri felt that the Club should retain its sponsorship of this event because this is the only major event that we are in charge of. Don will arrange for a porta-john, and Silvio will secure the liability insurance required. Aaron McNeely will notify all of the major astronomy publications.

Name Tags: These are available from Silvio and will cost \$7.00 each. There was a bit of discussion about perhaps making the print smaller for aesthetic reasons. The new tags will be produced with a new high resolution laser engraving process.

EVAC Field Trip? The Board decided that EVAC would not sponsor a field trip this year because the Club has recently been to Lowell Observatory and Kitt Peak. Tom suggested an afternoon trip to the Center for Meteorite Studies at ASU. If this happens, the Club will provide a one month notice. Some EVAC members could also collaborate on a trip to the Riverside Telescope Makers Convention in California on Memorial Day weekend.

Honorarium: The Board decided to retain the same honorarium amounts for EVAC guest speakers. The amounts are \$25 for in-town speakers and \$50 for out-of-town speakers. At these rates, the Club can afford at least six professional (\$50) speakers per year.

Public Star Parties for Pay? This issue was discussed in depth by the Board, and we concluded that these events are important for the Club's financial state. It comes down to this: either participate in these events or charge higher dues. The Club needs many willing volunteers to participate in these star parties. The Board also suggested that a position termed "Events Coordinator" be established to arrange for these events for the Club, and Ken Spruell offered to do this.

New Business

Loan a 'Scope': The Club owns two telescopes, one kept by Sheri, a 60 mm refractor, and one kept Ted Hendricks, a 6-inch reflector. These 'scopes would be loaned to EVAC members who do not have a telescope. Frank expressed interest in converting the 6-inch into a Dobsonian.

Beginners Outreach: The Board discussed having a 5 minute presentation at each EVAC meeting that would be geared towards beginners. After much discussion, the Board decided that a sub-meeting should be held to at a later time to deal with this issue.

July Newsletter: Robert is going to be out of town in July, and he suggested combining the June and July issues into one and sending out postcards in July stating the Club events and dates. Robert also wants to relinquish his editorial position for the newsletter next year. Aaron McNeely and Robert Kerwin expressed an interest in assuming the editorship duty. Ken suggested that the Club should purchase a copy machine to reduce the costs of publishing the newsletter. Ken is a licensed Canon technician, and someone would need to volunteer to store the copier.

New Meeting Room: EVAC meetings have been well-attended, and the Board suggested getting a larger room for the EVAC meetings to help make everyone more comfortable.

Member Survey: Ken expressed an interest in administering a survey. The Board agreed that it was a good idea as long as something was done with the data!

EVAC Secretary Report

I have notified the major astronomy publications of the date of the All Arizona Star Party and our Astronomy Day Public Star Party at Scottsdale Community College. I sent e-mail to people at Sky & Telescope, Astronomy Magazine, and Astronomy Now in England. I also posted a notice on the sci.astro and sci.astro.amateur newsgroups and faxed all of the local news media concerning the Astronomy Day Public Star Party. I will also notify the local media concerning our Hale-Bopp Public Star Party when we have clarified where it will occur. In response to my sci.astro posting, Richard T. De Van of Salt Lake City sent me e-mail stating that he would include a list of our activities and a link to the EVAC home page in his "Under the Western Sky..." site (<http://www.geocities.com/yosemite/3612>).

The official EVAC Home Page is the following:

<http://www.psi.az.com/polakis/evac/evac.html>

As EVAC secretary, my internet address is amcneely@primenet.com. I used to use an America On Line e-mail address but have canceled it for obvious reasons. I also have a home page where I post my Naked Eye Astronomy articles (<http://www.geocities.com/capecanaveral/3784/index.html>). I must add that I am just a beginner at HTML programming.

I am in charge of obtaining discounted books for Club members through Kalmbach and Sky Publishing. I haven't dealt with Sky Pub yet, but Kalmbach offers 1/3 off of books that they publish and 1/4 off any others in their catalog. This is a good deal, plus they don't charge for shipping. Contact me if you wish to order something.

Letters to the Editor

To the Editor and Members of EVAC,

Light pollution (L.P.) has to be astronomy's worst enemy, an insidious "disease" slowly killing our beloved hobby. Since there are about 200,000 amateur and professional astronomers in the U.S. and perhaps another 300,000 residing in other countries, why is the

membership of the International Dark-Sky Association (I.D.A.) only 1,954? Anyone who enjoys astronomy should support the I.D.A., a non-profit organization which strives to preserve our dark skies. Utilizing various resources, the I.D.A. has made inroads in the battle against L.P. But it's a never ending battle which requires constant vigilance. It's our responsibility to fight it and save our dark starry skies not only for us, but future generations of stargazers. I urge you to join the I.D.A.; we CAN make a difference by educating our community about sensible lighting. Their newsletter regularly reports progress on the L.P. front. I hope to see the day we are 50,000 strong - wielding that much more clout. Membership is \$20 a year (a modest sum for such a worthy crusade). Write: International Dark-Sky Association, 3545 N. Stewart, Tucson, Az. 85716

Sincerely,
Bill Dellenges
6130 E. 16th Ave.
Apache Junction, Az 85219

NEW MEMBERS by Sam Herchak

Time flies! It has been almost six months since I published the names of our new members. Please join me in welcoming these folks to EVAC!

Dave Acree	Doug Amos
Howard Anderson	Jack Anderson
Jim Blaugh	Lynn Blaugh
David Currie	Bob Davidson
Dave Erhart	Stan Ferris
Richard Fogle	Joe Goss
Hugh Grant	Thomas Heywood
Diana Krohn	Craig Lindblad
Michael Mackowski	Massoud Mortazavi
Dave Richardson	Loren Scobee
Jonathan Teets	Pat Wagaman
Roger Walters	Ken Watson
Jim Wayland	Vivian Wayland
Frank Widman	Scott Winkler
Peter Wlasuk	Bill Zachar
Dianne Zachar	

Asteroid Interamnia Occultation December 17, 1996 by Bill Peters

On the night of December 16/17, 1996 several EVAC members had ringside seats to the first well observed occultation of a star by an outer-belt dark asteroid. The International Occultation and Timing Association (IOTA) had predicted that 10.3 magnitude asteroid Interamnia would occult a 10.1 magnitude star in the constellation Persius shortly after 2:00 a.m. local time. The combined light of the asteroid and star would

Guy next discussed the mechanisms that concentrate meteorites at specific points in Antarctica. The South Pole has an elevation of 9000 feet, the ice shelf angles down towards a height of 1000 feet at sea level. This disparity results in a downward flow of the ice shelf. Meteorites that impact the ice shelf are carried along. At specific points the ice flows up against buried mountains, the Trans-Antarctic Mountains, and the ice, with nowhere to go, sublimates in the dry, katabatic wind and leaves behind an enriched zone of meteoritic material. There is some debate as to whether these meteorites can ever come into contact with water. It is feasible that the dark, meteoritic material preferentially heats up in sunlight causing any snow to melt upon contact with the meteorite. This possibility should be taken into account when interpreting the claims of fossil life in Martian meteorites because the main meteorite in this controversy was found in Antarctica. The ice itself has been subjected to great pressure which has driven out any gas bubbles. The resulting ice is solid and clear, it scatters light just as the atmosphere does and appears as a vivid blue in color.

The expedition of six meteorite prospectors were dropped off by an airplane onto the merciless environment of the Antarctic ice sheet. Their shelters consisted of "Scott tents," named after the explorer and essentially the same item that he used, which measure 8 x 8 x 8 feet in volume. Two people shared each tent. The majority of the expedition's time, about 18 hours per day, was spent in these tents and the expedition only had 18 days of searching out of 5 weeks due to weather. The tents were heated by gasoline stoves because gasoline does not freeze at extreme temperatures. As can be imagined, these stoves were hazardous and actually presented the main danger to the expedition in the form of tent fires. Guy recounted how he once witnessed a jet of flame shooting out of the door of one of the tents. The floor of each tent was solid ice at the temperature of 32 degrees, the interior of the tent at the top would attain +90 degrees, which is where the expedition would place articles to thaw.

During the Antarctic summer the Sun doesn't set from the location of the expedition. Guy related that this situation was very disorienting for somebody used to the sky's usual appearance from our temperate latitude. The temperature, at -20 degrees, was coldest at around 7 am. On one day, Guy chucklingly recounted, the weather obtained a temperature/wind chill combination of -75 on the day that dignitaries from the National Science Foundation dropped in for a visit. On one occasion a large, ocean bird flew into the camp for a moment and left. That was the only form of life that the expedition witnessed in their five week stay.

Each member of the party wore multiple layers of clothing with large, white boots filled with air to insulate. They also had to wear face masks and

goggles. Moisture from breath would freeze on the outside of the masks and form icicles. Ultraviolet protection was required from the goggles because the radiation was so intense that it would blind a person in a matter of minutes. The clothing and gear together weighed about 20 lb. and was like wearing a spacesuit. When nature called, each member had to trek outside of the tent, dig a hole behind the windbreak of a ski-doo (snowmobile), and squat. Although Guy didn't mention this, I assume that the expedition also had to go without showers for 5 weeks. Their water was obtained from melting ice and they probably had to sponge bathe.

On the days when the weather cooperated, the team would set out for locations a few miles from the camp. They drove ski-doos equipped with GPS (Global Positioning System) antennae. At the site, the team proceeded in a rigorous manner to collect data. They would form a long line and proceed inward parallel to each other. They looked for any black object visible, which could only be meteoritic. If a meteorite was sighted the entire team would gather around to help in the data gathering. They used sterile scissors to pluck the object out of the snow, next they would measure the object and state the percentage of fusion crust, the glassy, outer coating on a meteorite due to its fiery passage through earth's atmosphere, that was present. The meteorite was next placed in a sterile plastic bag with a sterile, individually numbered metal tag. Next would come a rough estimate of the category in which the meteorite belonged, chondrite, achondrite, carbonaceous chondrite, or iron. After all of this they placed a flag in the meteorites prior position in the ice and took a GPS reading. The group encountered difficulties with the equipment. For example, the plastic bags were difficult to peel open, a team member would have to take off a glove and wet their fingers, a chilling prospect as you can imagine. The GPS often required multiple attempts, which is why they used the flags.

At the end of the five weeks, the group had discovered 390 meteorites. Of these, 389 were stone and one iron, which provides a more accurate assessment of the amounts of each type that impact the earth. Of the stones, 12 were carbonaceous chondrites, 12 were achondrites, and one may be a "lunar rock." The largest was the size of a softball, usually each meteorite lay in the 2 x 1.5 x 1.5 cm range.

Dr. Consolmagno, despite all of the discomforts associated with this research, is saddened by the fact that he may never be asked to go to Antarctica again. He felt as though he had been a space explorer on another world, complete with suit!

March Guest Speaker: Bob Bergman will be speaking on the "NGC-IC Project."
April Meeting: Bring your comet photos.

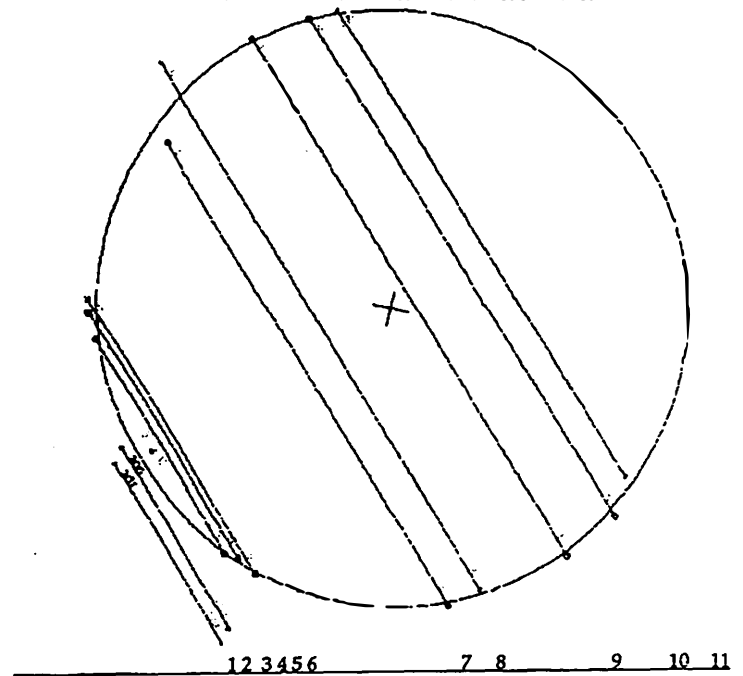
brighten to 9.4 magnitude resulting in a drop of 0.9 magnitude during the occultation. At the January EVAC meeting, Pierre Schwaar was able to show the rest of us a video of the occultation showing a 13.8 second dimming of the target star by the asteroid. By using the data collected from nine reporting observers across the country a preliminary plot of the profile of the asteroid has been determined.

Interamnia is the sixth largest asteroid in the main asteroid belt, but because of its surface is darker than coal (only 6% albedo) it was only the 704th asteroid discovered. The asteroid resides in the outer-belt group of the main asteroid belt that lies between Mars and Jupiter. These outer-belt asteroids tend to be darker than their nearer counterparts possibly as the result of dust coming from the moons of Jupiter. The star that Interamnia was occulting is essentially at infinity, meaning that the parallel lines of starlight would cast a shadow on the Earth equal to the estimated 333 km of the asteroid.

There were three predictions made of where the east-to-west path of the asteroid shadow would cross through Arizona. The earlier prediction by Carlsburg Automated Meridian Circle (CAMC) showed the shadow center would pass near Flagstaff with the southern limit crossing through the Phoenix area. Two later predictions by the US Naval Observatory (USNO) just days before the event, that was presumed to be more accurate, both predicted that the shadow path would be farther south. Both predictions placed the centerline just south of downtown Phoenix with the northern and southern limits including both Flagstaff and Tucson. It looked like an Arizona triple crown. Observers were alerted from across the state down to the Mexican border. Unfortunately for southern observers, the earlier CAMC prediction turned out to almost precisely correct. David Dunham, of the International Occultation and Timing Association (IOTA), has developed an initial plot of the occultation event. The plot shows that Interamnia is slightly elliptical at 336.8 km by 321.2 km, with a margin of error of 6.5 km.

The asteroid shadow moved from bottom to top across the chart. Each line represents the duration of the occultation for each observer. Observers Bill Peters and Randy Peterson at station 1 and Ken Zeigler at 2 just missed the event near Queen Creek and Globe, AZ respectively. Station 3 by Sam Herchak in Mesa, AZ observed a 0.1 second graze at the southern edge of asteroid. Station 4 is the Etscorn Observatory in Sorocco, NM. Station 5 is our own Pierre Schwaar in Phoenix. Station 6 is Paul Maley and L. Paller in the Cave Creek area. Station 7 is Anza Observatory in CA. Station 8 is Fulton Wright of Prescott, AZ. Station 9 is Bob Fried of Flagstaff, AZ. Station 10 is Table Mt. Observatory, CA. Station 11 is Gary Goodman of Camarillo, CA. You will note that Sam Herchak's graze

Profile of Asteriod Interamnia



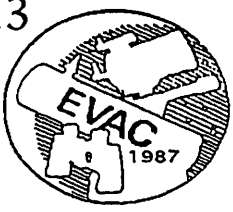
observation is within the ellipse indicating further flattening than the actual plot. The two anomalous exit reports of stations 8 and 9 may be the result of the greater difficulty of accurately timing reappearance events than true profile terrain. The cross lines in the center of the chart shows the orientation of the asteroid's major and minor axes.

The February issue of Sky & Telescope lists most of the prominent asteroid occultation events across the US for 1997. The next asteroid occultation that is supposed to cross Arizona is 377 Campania occulting a +8.4 magnitude star on March 21. Asteroid occultations are extremely difficult to predict accurately. Most predictions are for smaller asteroids whose orbits are less well known. Prediction errors are commonly 5 to 10 shadow widths or up to 500 miles off. Yet, this is one area amateurs can offer truly useful observations. Even carefully reported misses define the upper limit of the size of the asteroids. For a complete, updated list of asteroid occultations in 1997 check IOTA's home page at <www.anomalies.com/iota/splash.htm>.

THE 1997 MESSIER MARATHON by A.J. Crayon, SAC Deep-Sky Chairman

The 1997 Messier Marathon is a one night - all night - observing session held during the new moon of March. The goal is to observe as many entries in Charles Messier's magnificent catalog as possible; limited only by your observing skills, stamina, and the weather.

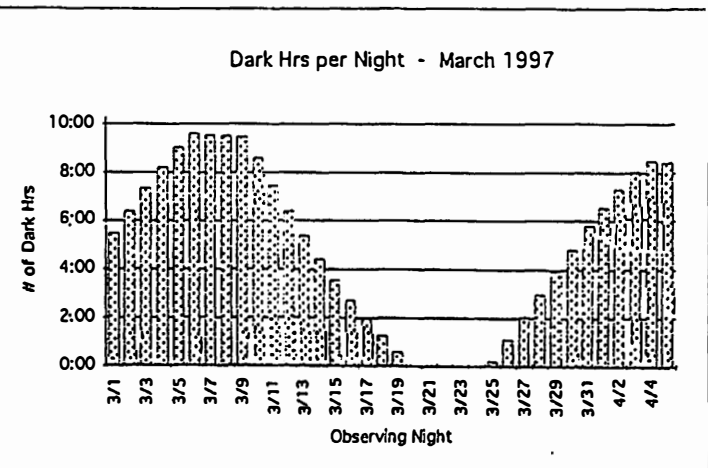
The Saguaro Astronomy Club, of Phoenix, Arizona, is pleased to sponsor the Fifth Annual Messier Marathon,

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
23 	24	25	26	27 *2:21 AM Occ	28	1 Local S Party *Excellent W. Lunar Libration *ALL MONTH NOTES
2	3 *Excellent S. Lunar Libration Sunset 6:23 PM Sunrise 6:51 AM	4	5	6 *7:00 PM PAS Mtg	7	8 Messier Marathon
9 *7 PM Saturn/Moon Conjunction	10	11 *Mercury in Conjunction with Sun	12 EVAC Meeting *9:24 PM Occ	13 *9:40 PM Algol at Min	14 *10:09 PM Occ *11:30 AM Aldebaran/Moon Conjunction	15 *8:08 PM Occ
16 *9:54 PM Occ *Excellent N. Lunar Libration	17 *Mars at Opposition *5:30 AM Hale-Bopp/NGC 7662 Conjunction Sunset 6:34 PM Sunrise 6:33 AM	18	19 *1:51 AM Occ	20 *Mars nearest to Earth *7 PM Tough Mercury/Saturn Conjunction *Vernal Equinox	21 *1:19 AM Possible Asteroid Occ *7:30 PM SAC Mtg	22
23 Hale-Bopp Public S. P. *9:39 PM Near Total Lunar Eclipse	24 *8 PM Hale-Bopp/M31 Conjunction	25	26	27	28	29 EVAC Cookout/S. P. *9 AM IDA Annual Meeting
30 *Saturn in Conjunction with Sun *Excellent S. Lunar Libration	31	1	2 *Hale-Bopp/Gamma Andromedae Conjunction *Venus in Conjunction with Sun	3	4	5 Sentinel S Party *8:34 PM Algol at Min *Mercury at Greatest E. Elongation

Date	Start	Title	Description
3/1/97	12:00 AM	ALL MONTH NOTES	<p>CALENDAR NOTES: Look in the Feb 1997 Newsletter for details on "Occ" events. "Algol at Min" refers to forecast minimum of this naked-eye variable star. See Sky&Telescope (S&T) or Astronomy (ASTRO) magazines for other good info.</p> <p>PLANETS: MERCURY puts on a good evening show late in the month—see Mar ASTRO pg 67. VENUS lost in the solar glare until April. MARS rises mid-evening. Reaches max apparent size of this year on the 20th—14 arcseconds and -1.3 magnitude. With good seeing, surface features will be visible—see Jan S&T pg 84/Mar ASTRO pg 88. JUPITER low in SE at dawn. Several conjunctions with naked-eye stars this month—see Mar S&T pg 77. SATURN is very low in the SW at dusk—lost to solar glare by month's end. URANUS and NEPTUNE rise several hours before the Sun now. PLUTO is well placed for observation in the AM sky. Near several 7th magnitude stars on the Scorpius/Ophiuchus border. A detailed finderchart such as pg 157 of the 1997 Observer's Handbook, an 8-inch scope, and a dark site are needed.</p> <p>OBJECTS OF INTEREST: COMET HALE-BOPP RETURNS TO THE NIGHT SKY MID-MONTH! See S&T or ASTRO. Variable star Mira (see Feb ASTRO pg 73); Asteroids Hermentaria & Hebe (see Mar ASTRO pg 68).</p>
3/6/97	7:00 PM	7:00 PM PAS Mtg	Phoenix Astronomical Society mtg, Brophy Prep, 4701 N. Central Ave. Turn off Highland into Main entrance, follow signs upstairs to Physics lab.
3/14/97	11:30 AM	11:30 AM Aldebaran/Moon Conjunction	See the star Aldebaran in the daytime! Look 0.5 degree west of Moon as it rises in the East.
3/17/97	5:30 AM	5:30 AM Hale-Bopp/NGC 7662 Conjunction	Comet Hale-Bopp passes 1.5 degrees N of the planetary nebula NGC 7662—see Mar ASTRO pg 69.
3/21/97	1:19 AM	1:19 AM Possible Asteroid Occ	Possible occultation of the star SAO 138801 by asteroid 377 Campania—see Mar S&T pg 84.
3/21/97	7:30 PM	7:30 PM SAC Mtg	Saguaro Astronomy Club meeting, Grand Canyon University, Fleming Bldg, Rm 105. Camelback and 33rd Ave.
3/29/97	9:00 AM	9 AM IDA Annual Meeting	The International Dark-Sky Association will hold its annual meeting today at the Hotel Park Tucson, 5151 E. Grant Rd, Tucson (520-323-6262). Registration begins at 8:30. Cost: \$25.

Dark of the Moon Table -- March 1997

OBSERVING NIGHT	START OF DARK	END OF DARK	TOTAL DARK	OBSERVING NIGHT	START OF DARK	END OF DARK	TOTAL DARK
SAT/SUN	3/1 7:48 PM EOT	3/2 1:16 AM MR	5:28	WED/THURS	3/20 4:31 AM MS	3/20 5:09 AM SOT	0:38
SUN/MON	3/2 7:48 PM EOT	3/3 2:13 AM MR	6:25	THURS/FRI	3/21 5:06 AM MS	3/21 5:08 AM SOT	0:02
MON/TUES	3/3 7:49 PM EOT	3/4 3:10 AM MR	7:21	FRI/SAT	none	none	--
TUES/WED	3/4 7:50 PM EOT	3/5 4:03 AM MR	8:13	SAT/SUN	none	none	--
WED/THURS	3/5 7:51 PM EOT	3/6 4:54 AM MR	9:03	SUN/MON	none	none	--
THURS/FRI	3/6 7:52 PM EOT	3/7 5:27 AM SOT	9:35	MON/TUES	none	none	--
FRI/SAT	3/7 7:52 PM EOT	3/8 5:26 AM SOT	9:34	TUES/WED	3/25 8:07 PM EOT	3/25 8:20 PM MR	0:13
SAT/SUN	3/8 7:53 PM EOT	3/9 5:24 AM SOT	9:31	WED/THURS	3/26 8:08 PM EOT	3/26 9:16 PM MR	1:08
SUN/MON	3/9 7:54 PM EOT	3/10 5:23 AM SOT	9:29	THURS/FRI	3/27 8:09 PM EOT	3/27 10:13 PM MR	2:04
MON/TUES	3/10 8:45 PM MS	3/11 5:22 AM SOT	8:37	FRI/SAT	3/28 8:10 PM EOT	3/28 11:10 PM MR	3:00
TUES/WED	3/11 9:51 PM MS	3/12 5:20 AM SOT	7:29	SAT/SUN	3/29 8:10 PM EOT	3/30 12:07 AM MR	3:57
WED/THURS	3/12 10:54 PM MS	3/13 5:19 AM SOT	6:25	SUN/MON	3/30 8:11 PM EOT	3/31 1:02 AM MR	4:51
THURS/FRI	3/13 11:54 PM MS	3/14 5:18 AM SOT	5:24	MON/TUES	3/31 8:12 PM EOT	4/1 1:55 AM MR	5:43
FRI/SAT	3/15 12:50 AM MS	3/15 5:16 AM SOT	4:26	TUES/WED	4/1 8:13 PM EOT	4/2 2:46 AM MR	6:33
SAT/SUN	3/16 1:42 AM MS	3/16 5:15 AM SOT	3:33	WED/THURS	4/2 8:14 PM EOT	4/3 3:33 AM MR	7:19
SUN/MON	3/17 2:30 AM MS	3/17 5:14 AM SOT	2:44	THURS/FRI	4/3 8:15 PM EOT	4/4 4:17 AM MR	8:02
MON/TUES	3/18 3:14 AM MS	3/18 5:12 AM SOT	1:58	FRI/SAT	4/4 8:16 PM EOT	4/5 4:46 AM SOT	8:30
TUES/WED	3/19 3:54 AM MS	3/19 5:11 AM SOT	1:17	SAT/SUN	4/5 8:17 PM EOT	4/6 4:44 AM SOT	8:27



EOT = End of Astronomical Twilight

MR = Moonrise

SOT = Start of Twilight

MS = Moonset

NOTE: Applies to Phoenix area (Mtn Std Time)

Bernie Sanden