East Valley Astronomy Club

President	Tom Harvey	998-0035
Vice-President	Ted Heckens	827-1524
Treasurer	Bob Kelley	451-7319
Newsletter	Bill Smith/Roy Halverson	831-1520/844-9563

June *Newsletter* *1992*

EDITOR'S NOTES

Please note the change in the room number for the monthly business meetings! Until further notice the monthly meetings will be in:

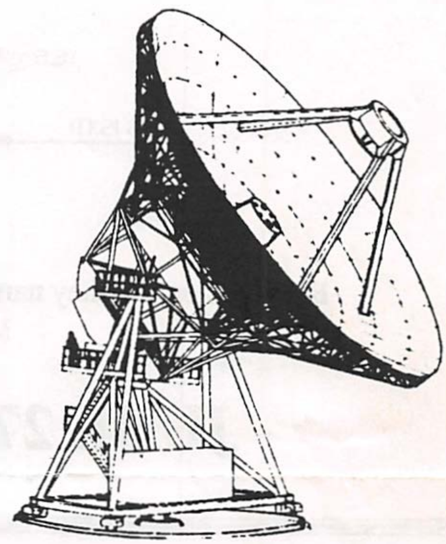
ROOM 170

Dick Simmon indicated that this room is just around the corner from our former room.

Hang on to this copy of your newsletter, because it will be the last issue until September. It was decided that we could keep the costs down if we didn't publish during July and August summer months. Each newsletter costs about $75.00 to duplicate and mail to members. This is a bit steep based upon our annual dues. If you have any suggestions, please notify your president.

On another note, rumor has it that Ted Heckens is starting a special interest group (SIG) dedicated to looking at the moon. With our weather this should be a very active group. Give him a call.

The only club member I know who is really not bothered by all this lousy weather is Michael Janes. It must be nice to be sitting around waiting for your telescope to be built! Michael is sans telescope for awhile. He sold his Meade and is patiently (well, who wouldn't be patient with cloudy, rainy weather) while Pierre Schwarr finishes his 16.5 inch monster. Some people have all the luck.



THESE AREN'T BOTHERED BY CLOUDS!

WHO WANTS TO CHIP IN AND BUY ONE?

MARK YOUR CALENDAR

EVAC BUSINESS MEETINGS

June 17th - SCC Room PS 170

July 15 August 12

DEEP SKY STAR PARTIES

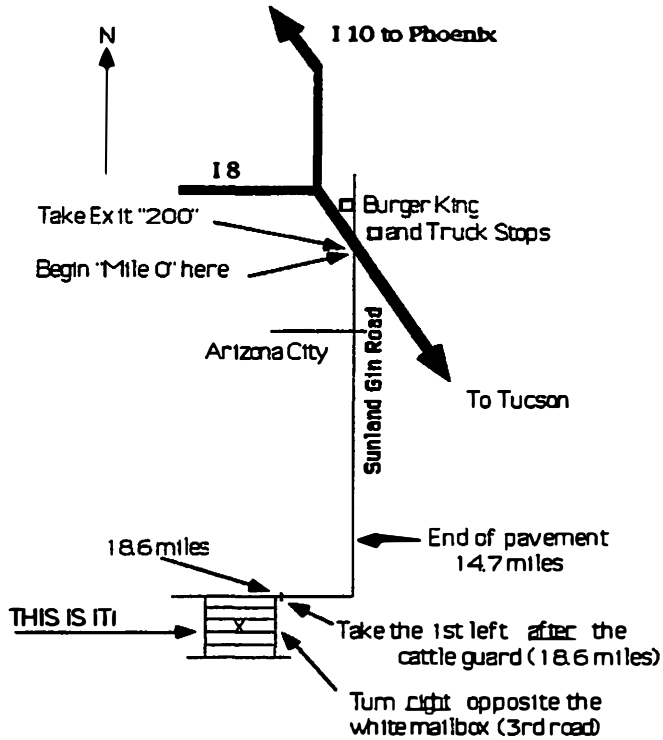
June 27th August 1 Sept. 26

Southern site-see map inside.

LOCAL STAR PARTIES

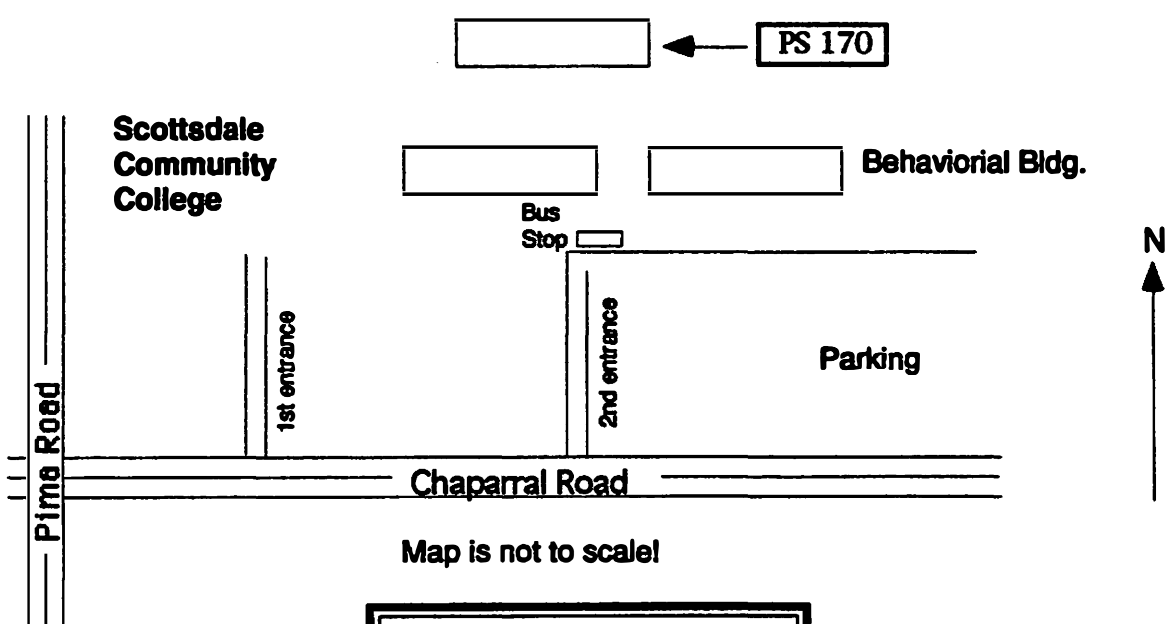
June 20th -Carefree Site- July 25th

Call Bob Kelley for instructions.



Believe it or not, they named the street opposite the white mailbox:
MOON CHILD!!

JUNE 27th - DEEP SKY



Map is not to scale!

Next business meeting JUNE 17.
Room PS 170

June Highlights 1992
by
Byron Scott

Calendar

Day	*Date*	*Event*
Mon.	01	New Moon [Note there are two new moons this month]
Wed.	03	Tau Herculid Meteors
Thur.	04	Moon at perigee
Mon.	15	Full Moon [Sometimes know as the Rose Moon] Partial eclipse of the Moon
Tue.	16	Winter solstice on Mars
Thur.	18	Asteriod Pallas at opposition
Sun.	21	Summer solstice—The Anasazi built Casa Rinconada at Chaco Canyon, New Mexico. It was built to celebrate the arrival of the solstices. This great kiva is astronomically aligned to the cardinal directions.
Tue.	23	St. John's Eve—This used to be celebrated in England by building large bonfires. Moon Last Quarter
Tue.	30	New Moon—Second this month Total eclipse of the Sun {Uruguay and off the Cape} The climax of this eclipse takes place in the middle of the South Atlantic. It lasts only 5 minutes and 25 seconds.

June Flashback

On June 3, 1965, Edward White was the first American to perform an EVA (Spacewalk). It lasted for 21 minutesoutside the security of Gemini 4 (USA).

July Highlights 1992

by

Byron Scott

Day	Date	Event
Thur.	02	Moon at perigee
Fri.	03	Earth at aphelion
Sat.	04	Independence Day-Thank you, John Adams and Co.
Mon.	06	Mercury at greatest elongation east
Tue.	07	Moon at first quarter
		Uranus at opposition
Wed.	08	Capricornid meteors
Thur.	09	Neptune at opposition
Tue.	14	Full Moon—Sometimes the moon in July is called the *Thunder Moon.*
Wed.	22	Comet Grigg-Skjellerup at perihelion—Obital period for this comet in earth years is 4.91. Distance at perihelion (a. u.) is 0.858.
		The Tewa Native Americans of the Rio Grande called comets "tailed stars." They viewed comets as interlopers in the sky.
		Moon at last quarter
Mon.	28	Delta Aquarid meteors—This is the peak day for this shower with an hourly rate of 20. The duration for this shower is 14 days.
Wed.	29	New Moon
Thur.	30	Moon a perigee

July Flashback

On July 28, 1964, Ranger 7 (USA) was the first successful lunar probe, launched by the United States, that impacted on the moon. It returned 4,316 close-up photographs of the moon's surface up tothe time of impact.

Exploring Scorpius

The constellation Scorpius covers about 500 square degrees, making it the 33rd largest constellation. The brightest star is Antares, whose name means "Rival of Mars," so named because of its red color. This area contains some of the most beautiful star fields in the summer sky. Scanning this area with binoculars or low-power telescope is a relaxing way to start an evening of deep sky observing.

Let's start off with something easy. **Beta Scorpii** is a nice double star, with a separation of 14 arc-seconds. This star marks the northernmost "claw" of the scorpion, about nine degrees northwest of Antares. The stars are magnitudes 2.6 and 4.9 and both appear white, although some observers report a tinge of blue in the fainter star. Now move southeast along a line from Beta to Antares. Halfway between the two stars is **M80**, a bright globular cluster. This cluster is very concentrated toward the center. Globular clusters are classified by the degree of concentration toward the center. There are twelve classes, ranging from I (very concentrated) to XII (very sparse). In this classification scheme, M80 belongs to class II. In my 8-inch telescope, the outer fringes are resolved into very faint stars and a mottled texture can be seen across the core of the cluster. Now center your scope on Antares and look about half a degree to the northwest. Almost hidden in the glare is the tiny globular cluster **NGC 6144**. This cluster is weakly concentrated (class XI) and shows a sprinkling of faint stars across a round hazy patch. A much easier target is **M4**, just 1.5 degrees west of Antares. This cluster should be fully resolvable in 6-inch or larger scopes. A prominent string of brighter stars runs north-south through the center of the cluster. This cluster is placed in class IX, so it does not appear very concentrated toward the center.

Leaving the Antares region, we move south to the region of Zeta Scorpii. Less than a degree north of Zeta lies the brilliant open cluster **NGC 6231**. Moderate-size instruments should reveal about 100 stars. The bright stars seem to be juxtaposed against a scattering of fainter stars, giving the cluster an appearance similar to that of the Pleiades. This cluster is impressive and makes a good object for public star parties. Our next object is **NGC 6302**, which lies about six degrees northeast of NGC 6231. Also called the Bug Nebula, this unusual object is often classified as a planetary nebula, although it bears little resemblance to other planetaries, even when seen through a small telescope. At low magnifications, this object looks much like a galaxy with a bright, almost stellar core and an elongated shape. At higher powers, the west end appears brighter than the east end and fans outward. The eastern segment is shorter, fainter and somewhat more sharply defined. This object may be somewhat elusive because of its small size and location in a relatively sparse field; however, this object is not extremely faint. Be persistent and the nebula will pop into view.

Moving northeast, sweep up the bright open cluster **M6**. In moderate-size instruments, you will see about 75 stars in an area 30 arc-minutes across. On the eastern side of the cluster you will notice a red star (BM Scorpii). Our final object is **M7**, just three degrees southeast of M6. M7 holds the honors for the southernmost Messier object. This large, weakly condensed cluster is best viewed at low powers, and appears somewhat box-shaped. You should be able to see about 100 stars with an 8-inch telescope.

This is just a sample of some of the brighter objects in this region. There are many other fascinating objects in Scorpius–why not take some time to probe deeper and see for yourself what this area has to offer?

Scorpius

Tirion chart: 22, 15
U2000 charts: 290-291, 335-336, 374-377, 406-408

Name	Type	Mag	Size	R.A.	Dec.
β Sco	dbl	2.6/4.9	13.7"	16h 06m	-19.7
M80	gc	7.3	8.9	16h 14m	-22.9
NGC 6144	gc	9.0	9.3	16h 24m	-25.9
M4	gc	5.8	26	16h 21m	-26.4
NGC 6231	oc	2.6	26	16h 51m	-41.7
NGC 6302	pn	—	1.4	17h 10m	-37.1
M6	oc	4.2	33	17h 37m	-32.2
M7	oc	3.3	80	17h 51m	-34.8

Comets: Mudballs of the Solar System?

Infrared images reveal trails of true grit

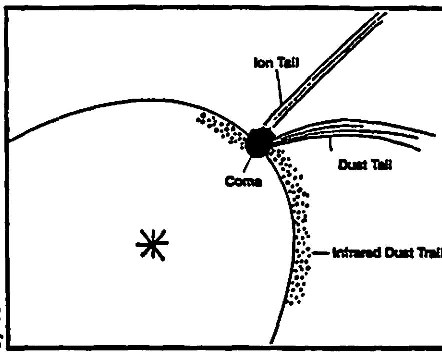
By RON COWEN

For some 40 years, astronomers have thought of comets as huge dirty snowballs — flying icebergs mixed with small amounts of rocky debris, dust and organic goo. Now, two astronomers have muddied that image.

Instead of snowballs, comets may more nearly resemble frozen mudballs, they conclude.

The new finding, based on infrared images of cometary dust, indicates that the primordial recipe for making comets required about equal volumes of rock and ice rather than primarily ice. "It's really a different picture of what the comet nucleus could be," says Mark V. Sykes of the University of Arizona in Tucson.

Intriguingly, the revised rock-to-ice ratio approximates the composition of Pluto and Triton, Neptune's largest moon, he notes. That similarity supports the notion that many comets were formed in the same region of the solar system as Pluto and Triton — and that an agglomeration of comets may well have created these bigger bodies.



Sykes

Comets generally exhibit three features in visible light: the coma, an ion tail and a dust tail. Analyses of data taken by the Infrared Astronomical Satellite now suggest that many comets also sport a dust trail, made up of larger particles that move slowly away from the nucleus and closely follow the orbit of the parent comet.

Astronomers, from the ancient Chinese onward, have scrutinized comets and pondered their meaning. Sykes began his rocky odyssey while a graduate student in 1986, when he spotted an odd feature in several images constructed from data gathered by the Infrared Astronomical Satellite (IRAS) in 1983. Telltale streaks in the images revealed the presence of giant, never-before-seen trails of dust particles associated with three comets that visit the inner solar system every three to seven years. These trails — a phenomenon related to, but separate from, the dust tails comets flaunt in visible light as they move near the sun — consist of larger, pebble-sized debris that scatter sunlight poorly. Because they glow primarily in the infrared, the trails had gone undetected with optical telescopes.

Unaware of the deeper implications of their work, Sykes and his colleagues reported their curious finding in the May 30, 1986 SCIENCE.

A new analysis of the images by Sykes and Russell G. Walker of Jamieson Science and Engineering, Inc., in Scotts Valley, Calif., now reveals a total of 17 infrared dust trails, eight of them associated with comets that pass near the sun an average of once every seven years. Moreover, most of the eight comets were glimpsed by IRAS at their closest approach to the sun, when dust particles heat up and glow brightest in the infrared. The remaining nine trails are not associated with known comets, hinting at the existence of short-period comets not yet discovered.

For Sykes and Walker, these latest findings suggest that all short-period comets — those that pass near the sun at least once every 200 years — have infrared dust trails. The relatively small number of trails so far detected merely suggests that only those comets closest to the sun at any given time would likely reveal the dusty features in infrared images, Sykes says. In addition, the amount of dust in the trails indicates that rocky debris accounts for three-fourths of a comet's mass (ice would provide the other 25 percent) and half its volume, the astronomers reported last November at a meeting of the American Astronomical Society's Division for Planetary Sciences. Sykes and Walker provide further details in the February ICARUS.

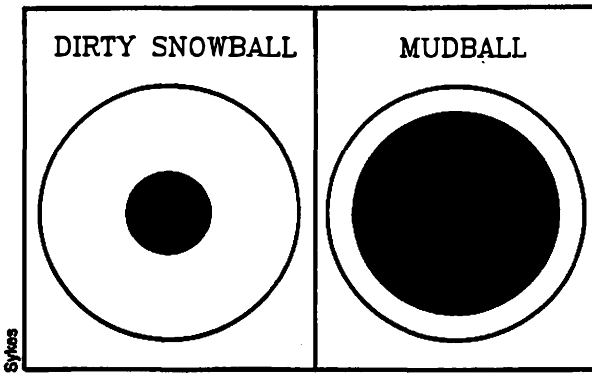
Their comet-composition estimate, though consistent with other recent measurements, remains speculative, since no one has ever seen the inside of a comet. Indeed, the chilly surface of a comet reflects too little light for astronomers to observe the object during most of its orbit. Only when it nears the sun does the frozen body burst back into life, sporting three distinct features in visible light — a coma, or cloud of dust and gas surrounding its nucleus; a dust tail, composed of tiny particles less than a millionth of a meter in diameter; and an ion tail, composed of charged gas molecules.

In an effort to account for these tails, and to explain why comets passing close to the sun don't simply burn up, astronomer Fred L. Whipple of the Smithsonian Astrophysical Observatory in Cambridge, Mass., made a now-famous proposal. In 1951, he suggested that comets contain large amounts of ice interspersed with dust — a theory that became known as the dirty snowball model. As a poor heat conductor, ice would enable a comet to withstand the sun's intense radiation, Whipple reasoned. Moreover, he calculated, a blast of heat from the sun would vaporize ice on the surface of a comet, converting some of the frozen material into a jet of gas that could propel dust out of the comet — like sand lashed by a fierce windstorm. Pressure exerted on the dust by solar radiation then sweeps the dust into a tail; charged particles from the sun (the solar wind) sculpt some of the comet's expelled gas into a separate, faint ion tail.

Whipple's enduring model has proven highly successful in explaining several idiosyncrasies about comets. Sykes and his colleagues don't dispute that a comet's nucleus contains a substantial amount of ice. Indeed, the vaporized ice is required to expel the centimeter- to millimeter-size particles that make up the infrared trails observed by IRAS. (Material in the infrared trails moves at one hundredth the speed of the dust in the visible-light tails and follows the orbit of the parent comet more closely.) But the sheer mass in these trails requires a dirtier version of the comet nucleus than astronomers had envisioned, Sykes says.

Says comet expert Paul R. Weissman of the Jet Propulsion Laboratory in Pasadena, Calif.: "I don't think of this [the new work] as a replacement for the Whipple model, but just that we've added new complexity to go along with new observations."

Weissman notes that the European Space Agency's Giotto spacecraft, which flew within 605 kilometers of Comet Halley's nucleus in 1986, found about three times as much rock as ice in that classic comet. The finding, at first considered an anomaly, agrees with the trail results of Sykes and Walker.



Fraction of a comet's nucleus, by mass, consisting of dust (dark areas) and ice under the dirty snowball and the mudball models. Debris and ice would be interspersed throughout the nucleus rather than isolated in separate layers, as depicted for simplicity in these diagrams.

That ratio of rock to ice also matches the density of two denizens of the outer solar system: Pluto and Triton. Researchers have speculated since the early 1980s that short-period comets formed in the same region of the solar system as these bodies — between the present-day orbits of Uranus and Neptune. Previous estimates of comet densities seemed at odds with this notion, but the new report increases support for the theory. "[Our study] adds another piece of information to understanding the origin of short-period comets," Sykes says.

He adds that the infrared dust trails show that comets expel more mass than researchers had estimated from previous observations. "Suddenly we have a whole lot more mass being lost than visible-light images had indicated," Sykes notes.

That realization, he says, leads to two tantalizing, though highly speculative implications. First, although researchers estimate that short-period comets last for tens of thousands of years, these celestial bodies may in fact waste away in half that time. And second, if the population of short-period comets remains fairly constant despite their shorter lifetime, then their proposed home base — an as yet unseen region of the outer solar system known as the Kuiper belt (SN: 4/21/90, p.248) — must have a far bigger reservoir of new comets than scientists had imagined.

On a murkier note, Sykes and Weissman observe that the origin of the gritty debris in the infrared trails remains a puzzle. Researches don't know whether these particles are fragments of the comet's crust or represent the basic building blocks of the comet's interior.

In the meantime, Sykes intends to keep searching for more of the dusty trails — both in IRAS data and in images taken by future infrared missions. Discovering many more such trails would substantiate the claim that all short-period comets are indeed mudballs.

To do this, Sykes faces the arduous task of scanning thousands more infrared images. Tracking dust is a dirty business, but someone has to do it. □

EVAC Membership as of June 1, 1992 (Sorted by name)

Name

Dennis & Carolee Bailey
Madhuri Bapat
David Brown
Don Carlson
Paul & Linda Cooper
Ron & Cindy Cox
Paul Dickson
John & Nellie Durham
Raul Espinoza
Don Farley
Edward Gruner
Roy & Carol Halverson
Tom Harvey
Bill Heckathorn
Ted & Brenda Heckens
Sam Herchak
Joan & Nolan Hodges
David & Mary Hoye
Jane Jackson
Michael Janes
Brandon & Debra Johnson
Mark Johnston
Mike Jones
Bob Kelley
Bob Kerwin
Reuben Koenig
George Kohl
Carl Lorson
Gene Lucas
Gordon MacKay
Pete Manly
Chris McFarland
Joe Murray
Everett & Judith Murvine
George & Peggy Palfy
Eriç Peterson
David S. Robbins
Lika Romney
Rick Salmon
Charlie & Paul Santori
Bob & Peter Schoenthal
Byron Scott
Bill Smith
Steve Smith
Doug & Annitta Smith
Emerson Stiles
Stan Student
Bob Swanson

EVAC Membership as of June 1, 1992 (Sorted by name)

Name
Bob Swift
Tucson Amateur Astronomy
Ken Willis
Russell Wilson
Don Wrigley
Art Zarkos

The Far Side

Inside the Sun

EVAC/Bill Smith
1663 S. Sycamore
Mesa, AZ 85202