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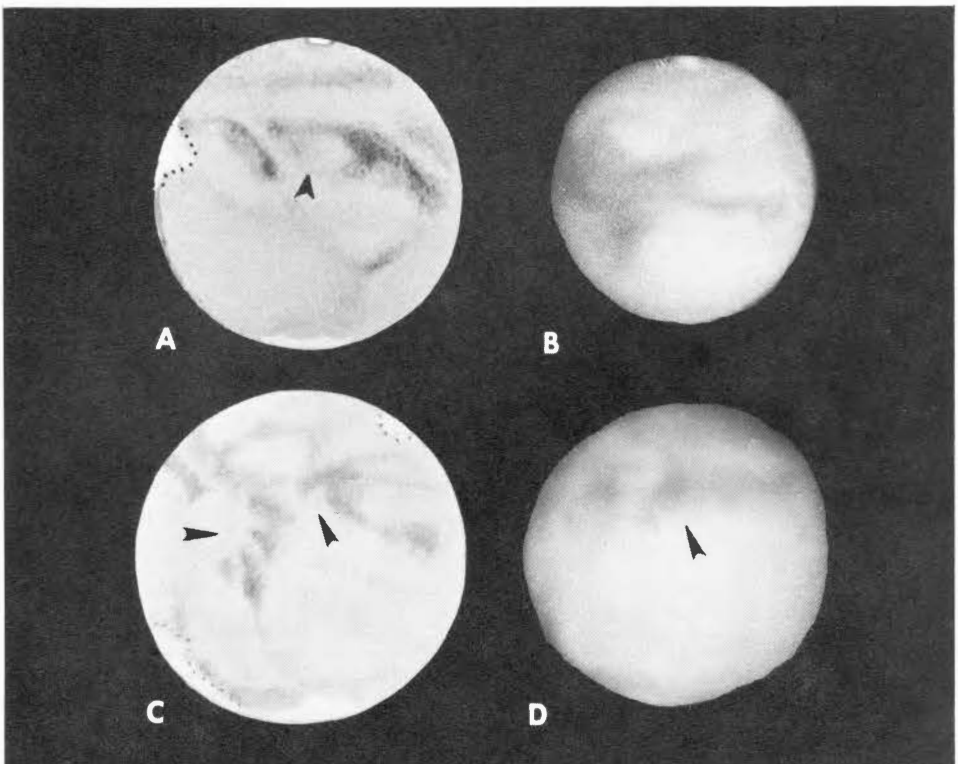

Four 1973-75 views of Mars showing common seasonal and new secular albedo feature modifications (arrows). See article by C. F. Capen on pg. 41 *et seq.* (A) Drawing of Sirenum-Cimmerium region (CM=182°) on Oct. 9, 1973, 15 hrs., 20 mins., U.T., 20-cm. reflector at 410X, Hideaki Saito. (B) Red-light photograph of Syrtis Major region (CM=316°) on Oct. 12, 1973, 1 hr., 38 mins., U.T., 40-cm. reflector, L. Tomas. (C) Drawing of Syrtis Major region (CM=302°) on Dec. 24, 1975, 11 hrs., 30 mins., U.T., 32-cm. reflector at 335X, Toshihiko Osawa. (D) Yellow-light photograph of Solis Lacus region (CM=120°), Dec. 22, 1975, 22 hrs., 25 mins., U.T., 96-cm. Cassegrain at Pic du Midi Observatory, Professor Jean Dragesco.

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ALPO

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IN THIS ISSUE

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A SEASON FOR VIKINGS

By: C. F. Capen, ALPO Mars Recorder

Two identical American Viking spacecraft are expected to end their 10-month journeys and go into orbit around Mars this summer of 1976. These spacecraft are a combination of a Mariner type orbiter and a complex landing probe. Their primary missions are to locate safe landing sites and then proceed to search for evidence of extraterrestrial life on the surface of the Red Planet. To do this, a series of orbital reconnaissance flights will be made over four pre-selected landing sites. These landing sites were chosen at locations which are thought to be in low regions of the planet where a maximum atmospheric pressure can be expected and in areas which have possibly been wet in the geologic past or presently become damp with the changing Martian seasons. A close-up evaluation of each site will be made from orbit by means of TV imaging, which gives a maximum resolution of about the size of a baseball diamond for surface roughness and elevation differences; by infrared thermal mapping for hot spots and frost layers on the surface and cloud top temperatures; by infrared water vapor detection for humid areas; and by analysis of the Martian atmosphere. The final descent stage of the lander consists of a parachute deployment followed by a terminal retro-rocket burn, which is turned off about 10 feet above the surface, the lander then being allowed to free-fall to the surface. Landing sites having boulders, slopes steeper than 19 degrees, or very soft, dusty surfaces must be avoided because the landing vehicle sits on three stubby legs which allow only nine inches of bottom clearance. The lander must remain nearly upright for its sophisticated instrumentation to function properly.

Three candidate landing sites have been selected at relatively low surface elevations where the higher atmospheric pressure increases the chances of the existence of transient liquid water, and hopefully where seasonal surface winds will not be too severe for a safe landing. Two of the candidate landing sites lie about halfway between the planet's equator and the edge of the summer north polar ice cap where daytime temperatures may be high enough to support life and where a seasonal source of water vapor may be available from the thawing polar cap. The other two landing sites were chosen at higher latitudes where the edge of the north cap may cover the surface during Martian winter. At these locales there may be water in the form of ice or vapor and "cold trapping" of organic material. If so, the biological test apparatus of the Viking lander may detect the presence of existing life forms or find evidence of fossil life. Because of the relative orbital geometry that exists between Earth and Mars, most significant Earth-based radar echo studies of the two sites closest to the Martian equator become possible just a few weeks before the first landing attempts. If the radar signals are interpreted correctly, they can give clues to the physical nature of the Martian surface. If the return signal from a site area is strong, it indicates that its radar roughness (a measure of rockiness) may not be too high and that the bearing strength (porosity) of the surface may not be too low.

If all goes well aboard the spacecraft, Viking team scientists plan to celebrate the American Bicentennial with Man's first successful touchdown of an automated environmental laboratory on the surface of the Red Planet late in the afternoon on July 4, 1976. In what kind of environment will the Viking probes find themselves upon landing during the early Martian summer? That Mars is a planet of four seasons was brought to our attention as early as 1784 by the eminent observer, Sir William Herschel. The seasons of Mars are analogous to those of the Earth because the two planets have similar axial inclinations. However, the Martian seasons are nearly twice as long as those of the Earth since Mars, in its outer orbit, requires 687 days to complete its year. The length of the Martian day is only 37 minutes longer than that of Earth. Thus, the daily behavior of the Sun, when viewed from a station on Mars at any given latitude, would not be noticeably different from that of Earth. Coincidentally, the season will be the same on both Mars and Earth when the Vikings reach the Martian shore. But what will the Martian climate and weather be like?

The distance of a planet from the Sun is a major factor governing a climate which is thermally favorable to life as we know it. Since Mars is on the average 49 million miles more distant from the Sun than the Earth, it receives less than half the solar heat that the Earth receives. Of course, there are other controlling factors which affect surface warmth such as atmospheric density and composition, water vapor clouds, dust clouds, and local areologic hot-spots. Telescopic radiometer observations and Mariner spacecraft measurements indicate that noontime temperatures for locations near the equator of Mars range from 50° to 80°F, nighttime temperatures drop below -80°F, and the polar ice caps range from -42°F at the cap edge to -200°F at the pole. In general, the dark albedo areas have been found to be warmer than the light ocher regions. The extreme range in temperatures which occurs from day to night and from the polar regions to the mid-latitudes indicates a windy and severe climate. Locally high winds are possible in narrow passes and valleys and on upslopes of basins.

A study of the historic record of "classical telescopic" observations dating back to the 1700's and the more recent data obtained since 1965 by the Association of Lunar & Planetary Observers gives some idea of the expected seasonal weather conditions that would be encountered by the Viking landing probes. Observed Martian meteorological phenomena, such as blue-white clouds, gray polar hoods, yellow dust storms, bright frost spots, and variations in the shape and albedo of surface features were chronologically catalogued for study according to the Martian seasonal date. Those weather conditions that were noted to recur in an annual seasonal cycle were used as "planetary symptoms" by the author in order to predict local climatic conditions.

The first spacecraft launched from the Earth on August 20, 1975 is known as mission A. It is tentatively scheduled to land around 34° W longitude, 20° N latitude, near Niliacus Lacus, as indicated on the relief map in Fig. 1. This prime A_1 site is located near an area known as Chryse (krī′sē), first named in 1877 by the famous Italian astronomer, G. Schiaparelli. According to the latest USGS topographic charts of Mars, this site lies on a gentle slope at the mouths of several large, sinuous valleys in a circular basin whose floor is about 10,000 feet below the mean surface pressure level. Since Mars has no seas for use as a mean reference level, the Martian zero elevation reference point was defined to lie at a 6.1 millibar areoid. This value is the minimum pressure at which water can exist in a liquid state at moderate temperatures. At pressures less than 6.1 mb water sublimates, or passes directly from a solid to a vapor, much as frozen dry-ice does at normal earthly temperature and pressure. The Chryse landing site's low elevation means a relatively high atmospheric pressure which is needed for the deployment of the 55-foot landing parachute and for the presence of liquid water. The site location is also important to the biological and geological experiments of the mission. The southern part of the Chryse region consists mostly of plateaus and chaotic terrain of low profile and well-defined channels which lead northward to a bright and rolling plains region that is probably covered by fluvial material mixed with aeolian deposits. Four large tributaried valleys empty into the basin from the south. If these meandering valleys were carved by running water in the past, as is strongly suspected by astrogeologists, then the Chryse basin is a likely place to search for ancient and present-day life forms. If there was fluvial (water) action, there can have been deposited a wide variety of scientifically interesting Martian rocks and minerals that were transported from far off highland areas. Radar data suggest that the Chryse surface roughness is not too high nor is the bearing strength too low. This result does not preclude extended hard rocky areas that could give the surface sampler problems in locating loose soil to scoop up for biological sampling. Radar also indicates the presence of rather large sand dunes which could make the site unsuitable.

ALPO telescopic observations show the Chryse region to have a history of seasonally controlled weather. During both Martian summer and winter, when one or the other of the polar caps has about completed its thawing phase, there have been observed morning-bright patches which were interpreted to be ice-fogs or ground frosts formed during the chill of the night. If this interpretation is correct, the local early morning wind velocity is expected to be light or calm. A modern explanation for the observed early morning bright patches is that they are dust palls resulting from a rapid downward flow of cold air into the basin, caused by a temperature differential between the cold night-side of the terminator and the sun-warmed side. Winds could become as high as 300 mph for short periods in the morning. By mid-afternoon the air is expected to be calm because the bright patches are usually seen to dissipate during the warmth of the day. ALPO Mars observers have reported early morning limb hazes often in Martian summer over Chryse-Xanthe. In May, 1903, during the northern Martian summer Percival Lowell saw a brilliant cloud projection, on the morning terminator, that was located over Chryse. Modern observations have recorded a few instances of widespread yellow dust clouds in this region during this season. This aspect implies possible strong winds of 200-300 mph for periods of several days. About 1000 miles to the southwest of Chryse lies the high Tharsis ridge with giant volcanic mountains with tops 15 miles above the mean elevation. This chain of volcanoes lies in a northeast-southwest direction and is officially known as the Tharsis Montes (tôr′sis mōn′tēz). Over two decades ago the late E. C. Slipher of the Lowell

Figure 1. A topo-relief map of Mars (USGS base map) showing common north hemisphere summer orogenic white clouds and brightened areas relative to topographic features. Map prepared and contributed by C. F. Capen. Simply inverted view with south along the left edge. The locations of the clouds and white areas were derived from measurements of ALPO 1965 and 1967 photographs in green, blue, violet, and ultraviolet light by C. and V. Capen. The tentative preselected Viking landing sites are shown at A1 (Chryse), A2 (Tritonis Lacus in Amenthes), B1 (Cydonia), and B2 (Alba). Site X (?), the Libya-Isidis basin, is a scientifically interesting location selected by Mars Recorder Capen. See also text of "A Season for Vikings".

Observatory announced that W-shaped white clouds were recorded in blue light over the Tharsis-Amazonis region. ALPO 1960's observations have shown that these white clouds form in the summer afternoon on the up-slopes of the giant volcanoes and along the south rims of the large equatorial canyons. Mariner 9 spectral observations have identified these as water clouds and not clouds of carbon dioxide. According to ALPO blue-light photos, these orogenic-formed clouds become so large in the summer evenings that they extend over the southwest part of Chryse. Little meteorological activity has been observed over Chryse during the winter season when the surface is clearly seen to be a strong ocher color. Recent ALPO observations showed bright afternoon white clouds over this region in December, 1975. Similar clouds

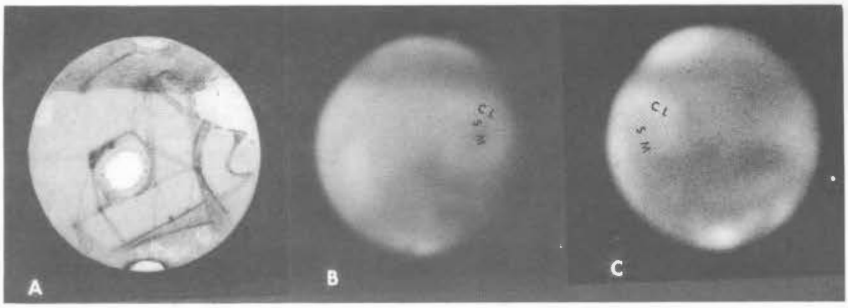

Figure 2. Three views of Martian summer orogenic clouds (CL) which form along the slopes of the Libya and Syrtis Major (SM) region. These seasonal clouds were first observed in 1862 by J. N. Lockyer and have been seen regularly each northern summer during the present century. (A). Drawing of Mars in April, 1920 during Martian July by G. H. Hamilton with the 60-cm. Alvan Clark refractor of the Lowell Observatory. (B) and (C). Photographs taken in natural colors and in violet light respectively in May, 1967, during Martian July, by C. F. Capen at the coudé focus of the 208-cm. Struve reflector of the McDonald Observatory. The cloud at first forms as a morning phenomenon on the slopes of Libya, then it wraps itself around the Syrtis Major, and later in the season it covers most of the region and is present all day. Contributed by C. F. Capen; see also text of "A Season for Vikings".

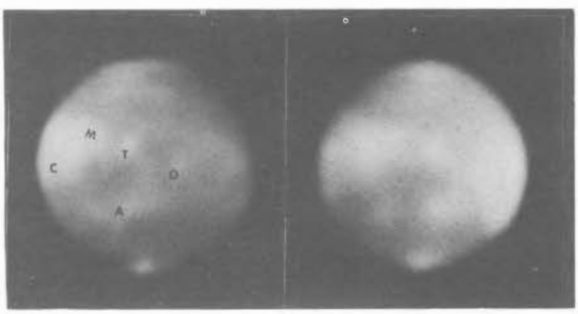

Figure 3. Two blue light photographs of Mars by C. F. Capen showing northern summer clouds over the Alba volcanic shield (A), Olympus Mons (O), Ascraeus Mons in Tharsis (T), the north slopes of Marineris Valles (M), and the Chryse basin (C). See also text.

can be expected here in July, August, and September, 1976.

If orbital reconnaissance shows the Chryse basin unsuitable, the spacecraft can be redirected to an alternate landing site at 252°W, 20°N, designated A_2, in Amenthes. Not following the naming scheme of the other sites, it has been called Tritonis Lacus (trī´t'n-is lă koos) by the astrogeologists. This site lies in an area of smooth plains, with infrequent small, bowl-shaped craters, near the east rim of the ancient Libya basin. Several large and partially buried craters lie to its south. The plains probably consist largely of aeolian debris which overlies volcanic plains. This entire region appears to have been affected by moderate to strong winds which imply the presence of large sand dunes.

From old telescopic observations, Antoniadi tells us that this region varies rapidly in color from light orange to a smoky grey in a marked manner. A variable whitish spot, about 100 miles wide and known as Nix Hesperia, has been seen at times during spring and summer in the rough terrain of Amenthes just north of the equator. The large secular darkening, so well recorded by ALPO observers in the 1950 decade, is also of this region. Observations from 1971 to 1976 show a continuing change in this region, suggesting a windswept changing landscape with probable sand dunes.

The mission B spacecraft's lander is scheduled to land around 10°W longitude, 44°N latitude, which is located on the borders of Cydonia and Mare Acidalium. The prime B_1 site is known as Cydonia (sī-dō´ nĭ-ə), first named in 1881 by Schiaparelli. The Acidalium is a dark prominent feature in the northern hemisphere of Mars and is a broad rising plain to the west of the site. The B_1 site is located in an area of smooth and rolling mottled plains, which are probably covered with aeolian sand and knobby terrain with few craters. Some volcanic cones, lava flows, and medium size craters with central peaks have been recognized there. Furthermore, it is at a low elevation, about 9,000 feet below the mean surface; and the temperature may rise as high as freezing so that liquid water may be present. This site appears to be geologically and biologically attractive.

ALPO color filter observations show a record of seasonal changes and meteorological activity in this region. During Martian late winter and early spring the B_1 site is often covered by arctic haze and possibly by an extension of the bright surface polar cap. Later in the northern spring, a dark polar collar covers this latitude. The collar is explained by strong polar winds which blow from the cold cap, due to a steep temperature gradient, and deflate the light colored surface layer of dust at the edge of the thawing cap. According to Antoniadi and also more recent observations by Japanese astronomers (OAA), the Acidalium region is often veiled by yellow dust. The dark features have a history of becoming paler in summer and autumn. The landing site lies on the western edge of Cydonia, which often becomes brilliant white. It is the high rough terrain in the area which is affected. If this whitening is due to the presence of water vapor and not wind-borne dust, the Cydonia site may be a likely place to look for life.

The alternate B_2 landing site has been chosen at 110°W longitude, 44°N latitude, which is located on a large volcanic shield. This classic feature was named Alba by Antoniadi because of its often bright, white appearance. Alba is a broad dome-shaped feature over 300 miles in diameter. A large complex caldera and a massive lava flow mark its summit. The Alba shield is surrounded by north-south tectonic structures known as fossae (fô sā); these appear as long, parallel grooves or ditches. The B_2 landing site lies on the north edge of the shield amid volcanic deposits at an elevation of about 6,500 feet above the mean surface level. In the telescope, Alba is often seen as a white oval in summer due to the formation of clouds on its slopes. See Fig. 3. It is suspected that these clouds are composed of carbon dioxide because of the high latitude. Wind velocity in this area is dependent upon how the observed clouds are formed. If they are being continuously formed by a standing-wave condition, then the wind velocity can be high. This bleak volcanic site does not appear promising for the search for life because of its relatively high elevation, low temperatures, and possible high winds.

Recent studies of the two sites located closest to the equator have raised doubts that they will meet the safety standards. A new prime site "C" is being searched for along the equator through radar and geological surveys. The author finds the Libya-Isidis basin the most scientifically interesting area on the face of Mars because of its well recorded history of seasonal activity, and it may be relatively humid. The Libya-Isidis basin lies just west of the Tritonis Lacus A_2 landing site. The basin's steep western slope controls the famous, dark, triangular Syrtis Major. It is here that equatorial white clouds have been observed many times during Martian summer since J. N. Lockyer first reported their presence in 1862. See Fig. 2. According to photographic and spectroscopic observations, these bright, white clouds appear when the atmospheric water vapor content is greatest in the northern hemisphere. They tend to form on the south and west slopes of the basin and sometimes cover most of Syrtis Major. The clouds show little motion other than the normal daily expansion in size. The Isidis, or northern part of the basin floor, is often covered by brilliant white patches, presumably composed of frost or fog. These bright spots show little movement but vary in size and brightness from day to day. Strong winter winds are indicated in this area because dust or sand is deposited from the basin on to the east slope of Syrtis Major. The summer climate is probably much milder because the Syrtis appears to be stable during this season. The floor of the Libya-Isidis basin is approximately 9,000 feet below the mean surface level and appears to be covered by aeolian sand deposits with a moderate abundance of small craters. During the summer it may have relatively high temperature and humidity and enjoy calm afternoons, according to the best observational and spacecraft evidence. If there are no large sand dunes or thick layers of dust present, perhaps the new landing site "X" should be here!

A preliminary global surveillance of Mars is planned for Viking using approach photography starting 5 days out on 14 June. Multicolor (red, green, blue, and violet) overlapping photos taken every few hours will allow a separation of clouds into the two basic types observed from Earth: yellow dust clouds and white clouds, which are either water or CO_2 condensations. December, 1975 ALPO Mars observations (351°-6°L_s) showed the start of early Martian spring clouds and bright patches (frost?) in the usual locations. Of particular interest was the presence of afternoon white clouds over the Chryse basin. More recent observations made from January through May, 1976 (12°-70°L_s) by Dr. C. D. Parker, T. Osawa, R. Tatum, J. W. Ryder, M. Adachi, R. Hull, J. Barnett, R. Lines, R. Rhoads, and C. Capen indicate a marked increase in meteorological activity. The Vikings will undoubtedly see these clouds from above. As the spacefrafts draw near Mars, prior to orbital insertion, the increased resolution may allow identification of cloud types, i.e. stratus, cumulus, etc. Their classification would aid in determining the surface wind conditions in landing areas.

We all wish the Vikings a safe and successful voyage. And may they find the distant Martian sandy shore strewn with many areologic treasures and abounding with ocher life!

IN MEMORIAM: DR. RUPERT WILDT

By: Paul K. Mackal, A.L.P.O. Staff

Dr. Rupert Wildt died of cancer on January 9, 1976, at Orleans, Mass. Born on June 25, 1905, in Munich, Germany, he had a very extensive career in astronomy, after graduating in 1927 from Berlin University, here in America as well as in Germany and in S. America. He is chiefly remembered for his extensive work in Solar System physics, including the identification of ammonia and methane in the atmosphere of Jupiter, though without confirmation until Kuiper carried out the measurements. He also proposed a wide variety of models of the interior of Jupiter and Saturn, including an anticipation of Ramsey's model long before it was popular to think in terms of solid hydrogen cores or liquid hydrogen cores for the major planets, Jupiter and Saturn. His more popular theories prevailed, however--those entailing ice cores of the major planets, now thought to be valid for Uranus and Neptune. Dr. Wildt also wrote extensively about the underlying theory of planetary interiors, e.g., in vol. III of the University of Chicago series of books, THE SOLAR SYSTEM, "Planets and Satellites," Chap. 5:pp. 159-212, 1961. He also wrote in a recent issue of the Smithsonian Astrophysical Journal. In 1966 he received the Eddington Gold Medal of the R.A.S., fittingly enough named after a man Wildt's equal in understanding the interior of the Sun.

Dr. Wildt's proposed color mechanism for the planet Jupiter is well known to the A.L.P.O. It is not well known that barium ions and strontium ions might also produce color on Jupiter, besides sodium and calcium ions. Just what colors would they produce?

Dr. Wildt's death was imparted to me by his wife, Katherine Wildt, on March 7, 1976, when I contacted her about the proposed role of barium ions in Jupiter's atmosphere. I had intended to discuss the matter with Rupert Wildt, but was sorely surprised to learn of his untimely death. An obituary appeared in the New York Times about mid-January but appears to have been missed by me and everyone else.

I sincerely doubt that there is anyone able to take Dr. Wildt's place, anymore than to take the place of Dr. Gerard Kuiper, who died last year.

IN MEMORIAM: HAL W. METZGER

By: Walter H. Haas

Hal W. Metzger, an amateur astronomer of Alfred, New York, died on May 2, 1976. He was an observer of the old school, thoroughly familiar with the night sky and intimately acquainted with telescopes. As an example, he once told Dr. John Stull, the Director of the Alfred University Observatory, after a quick look at a poor star image: "The objective's too tight; loosen the retaining ring about a quarter turn" - and he was absolutely right. Hal Metzger owned at least 60 telescopes at one time or another, including many long-focus reflectors and refractors. He invented an apodizing mask in 1947, marketed as the "Metzger Glare Reduction Screen" by the Edmund Scientific Co., to which he was an optical consultant in their early years. He played a key role in establishing an astronomy program at Alfred University. The astronomy and physics faculty there sponsors an annual Hal W. Metzger Award for achievement in the study of observational or theoretical astronomy. He was a member of the A.L.P.O. for many years.

Mr. Metzger was a native of Lorain, Ohio. He was a veteran of World War I. He served as an assistant station manager and program director at a Cleveland, Ohio radio station prior to 1949. He was a talented painter and had won awards in the past at the Cleveland Museum of Art and the Albright-Knox Art Gallery of Buffalo. He was also a writer and a journalist. After 1963 Hal and his wife, Margaret, operated for some years a small card and gift shop in Alfred, New York.

Hal carried on a very extensive correspondence with Rodger W. Gordon, an active A.L.P.O. member at Nazareth, Penna., and a frequent contributor of book reviews to this journal. They would exchange as many as 9 or 10 letters a week! It is from Mr.

Gordon and from newspaper clippings furnished by Mrs. Margaret Metzger that much of the information in this sketch has been obtained.

We can perhaps do no better than to quote the last two paragraphs of Dr. John Stull's sensitive tribute in The Alfred Sun for May 6, 1976: "Tonight, that light is gone, and we shall not see him here again. But before the clouds ended tonight's class, a student called me to the big refractor to show me the star cluster that was Hal's favorite object.

"Whatever our beliefs, we surely live on in the hearts and minds of those who knew and loved us. And so, each time I see M-13 in Hercules, each time I go out a door at night and instinctively look up, as we both did, I shall miss him. Godspeed, Hal; may you have clear skies and steady air, until we meet again."

PERIODIC COMET D'ARREST

The information in this note has been taken from materials communicated by Mr. Dennis Milon, the A.L.P.O. Comets Recorder. E. Roemer of the University of Arizona reported in *IAU Circular* No. 2934 that she and C.A. Heller recovered this comet on exposures with the Steward Observatory 229-cm. reflector on Kitt Peak. Positions were measured on February 25 and March 25, 1976, with the stellar magnitude near 21.5 and 20.6 respectively. The images were too weak, especially on February 25, to reveal the cometary character.

The ephemeris below was derived by B.G. Marsden from observations during 1950-71 and with consideration of the perturbations by the nine principal planets and also of non-gravitational effects. It differs slightly from the ephemeris in *Handbook B.A.A.* for 1976; and the uncertainty is really several times the difference, possibly as much as $\Delta T = \pm 0.2$ days. See also Marsden *et al.*, 1973, *Astronomical Journal*, Vol. 78, pg. 211. In the ephemeris Δ is the distance of the comet from the Earth; and r is its distance from the Sun, both in Astronomical Units. The predicted stellar magnitude m is one determined by Mr. John Bortle, one of the most active ALPO comet observers. He noted that Periodic Comet d' Arrest has undergone considerable brightness surges closely following perihelion passage at almost every apparition. His values for m are based on a study of the observations from 1857 to 1970 and assume the maximum of the surge to occur 20 days after perihelion passage. Experienced observers of comets will be wary of taking any predicted values too literally. The ephemeris here is condensed from one given in *IAU Circular* No. 2900.

The elements used by Dr. Marsden are:

T = 1976, August 12.8401, Ephemeris Time
$\omega = 178^\circ.9271$
$\Omega = 141^\circ.3513$
$i = 16^\circ.6898$
Elements ω, Ω, and i are relative to the mean equator and equinox of 1950.

Epoch = 1976, August 10.0, E.T.
e = 0.656142
a = 3.385149 Astronomical Units
q = 1.164009 A.U.
$n^\circ = 0.1582477$
P = 6.228 years

Date	Right Ascension (1950)	Declination (1950)	Δ	r	m
1976, July 21.0 E.T.	$19^h\ 43^m.65$	+17° 26'.0	0.224 A.U.	1.201 A.U.	11.1
26.0	20 01.47	+13 50.9			
31.0	20 23.47	+ 8 43.4	0.178	1.176	10.5
Aug. 5.0	20 50.09	+ 1 53.2			
10.0	21 21.12	- 6 24.6	0.153	1.165	9.2
Aug. 15.0	21 55.30	-15 15.5			
20.0	22 30.36	-23 23.0	0.160	1.168	8.4
25.0	23 03.66	-29 51.5			
30.0	23 33.08	-34 28.4	0.196	1.185	6.2
Sept. 4.0	23 57.61	-37 29.5			

Date	Right Ascension (1950)	Declination (1950)	Δ	r	m
1976, Sept. 9.0 E.T.	$0^h 17^m.16$	-39° 18'.6	0.249 A.U.	1.215 A.U.	6.7
14.0	0 32.20	-40 16.0			
19.0	0 43.48	-40 36.0	0.313	1.257	7.4
29.0	0 57.82	-39 57.4			
Oct. 9.0	1 05.61	-38 07.6	0.463	1.369	8.8
Oct. 19.0	1 10.39	-35 31.7			
29.0	1 14.41	-32 25.1	0.649	1.508	10.5
Nov. 8.0	1 18.98	-29 00.8			
18.0	1 24.59	-25 29.3	0.877	1.661	11.8
28.0	1 31.48	-21 57.7			

Observations of Periodic Comet d'Arrest should be mailed to Dennis Milon, 378 Broadway, Cambridge, MA 02139.

MORE DRAWINGS AND PHOTOGRAPHS OF COMET WEST (1975 n)

We take pleasure in presenting more sketches and photographs of this bright and exciting comet. Unless otherwise specified, the illustrations shown were contributed by Mr. Dennis Milon, the ALPO Comets Recorder. We hope to offer soon in these pages descriptive articles about this most unusual and extremely well observed comet. Meantime, we hope that our readers will enjoy these pictures by enthusiastic observers.

Figure 4. Photograph of Comet West (1975 n) by John West, Bryan, Texas. Transparency, limiting stellar magnitude, 4.7 at position of comet. U.T. March 9, 1976, $11^h 20^m$. Note north direction on photograph. Exposure 35 seconds. 35 -mm. single lens reflex camera, f 2.0. Tri X film, no filter, D-76 developer. Tail measured on photograph to be 9.8 degrees long in position angle 312°.

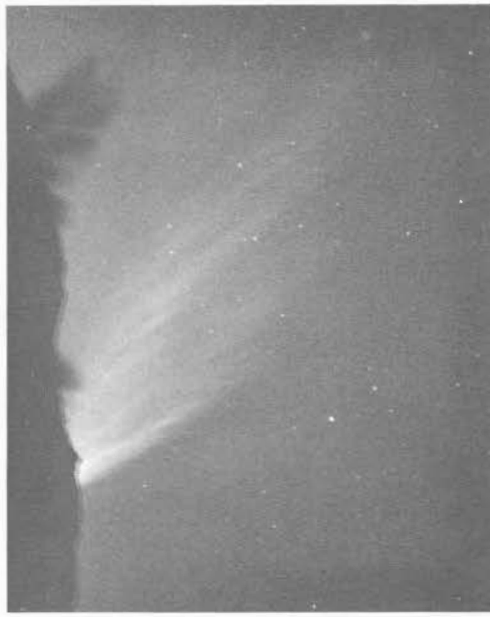

Figure 5. Photographs of Comet West (1975 n) by R.B. Minton, Tucson, Arizona on March 3, 1976. Tri X film, f/2.8, 135 -mm. focal length. Top: a composite of two 10-second exposures at $12^h\ 42^m$, U.T. Bottom: a 10-second exposure at $12^h\ 52^m$, U.T.

Figure 6. Drawing by John D. Sabia, Scranton, Penna., showing the break-up of the nucleus of Comet West. Made with a 9.5-inch Clark refractor at 150X on March 12, 1976, at 10^h 34^m, U.T., in bright twilight. Note the four nuclei, which were masked by the comet's glare at 9^h 17^m, U.T. Mr. Sabia estimated the two brightest nuclei to be only 1.0 to 1.5 seconds of arc apart.

Figure 7. Drawing of head of Comet West by John D. Sabia on March 12, 1976 at 9^h 17^m, U.T. 9.5-inch Clark refractor at 150X. Note the two bright jets. Compare to Figure 6; the four nuclei were not resolved on this dark sky.

Figure 8. Drawing of head of Comet West by John D. Sabia on March 24, 1976. Three stellar nuclei were seen. The separations of the others from the brightest one were estimated as 3.0 and 1.5 seconds of arc.

Figure 9. Drawing of head of Comet West by John D. Sabia on April 10, 1976. Two nuclei remain.

Figure 10 (left). Photograph of Comet West (1975 n) by R.B. Minton on March 31, 1976 near 12^h 5^m, U.T. A composite of two 5-minute exposures. Tri X film. Camara f/2.8, 135 mms. focal length.

Figure 11. Photograph of Comet West by John D. Sabia on March 8, 1976 at $9^h\ 17^m$, U.T. Sky conditions excellent; limiting magnitude 4.4 at position of comet. 50-mm. Nikon camara, f/1.4. Tri X film. A straight tail of Type I at position angle 301°. A broad tail 15° long from position angle 310° to 338°.

Figure 12. Photograph of Comet West by John D. Sabia on March 12, 1976 at $9^h\ 35^m$, U.T. Limiting stellar magnitude 4.4 at position of comet. 8-inch Schmidt, f/1.5. Plus -X film, no filter, Rodinal Developer. Type II dust tail 2½ degrees long at position angle 292°.

Figure 13. Photograph of Comet West (1975 n) by James Soder on March 7, 1976 at $9^h\ 30^m$, U.T. 35-second (unguided) exposure on Tri-X film with 50-mm. f/1.9 Miranda lens. Observed at new observatory site 10 miles east of Sidney, Ohio. Film processed in Microdol-X Developer. 2-negative composite print.

Figure 14. Photograph of the multiple nucleus of Comet West by Bill Keel, Dyer Observatory, Nashville, Tennessee. Taken on April 10, 1976 at $9^h 45^m$, U.T. 60-cm. reflector at the f/17 Cassegrain focus. Two-minute exposure on II a-D emulsion. Compare to Mr. Sabia's drawing on the same date in Figure 9 - probably the third and faintest nucleus shown on this photograph escaped the visual observer with a smaller telescope.

Figure 15. Photograph of Comet West by Bill Keel and Owen Hamilton, 60-cm. telescope in Baker-Schmidt mode (f/3.4, 208-cm. focal length), Dyer Observatory, Vanderbilt University. March 11, 1976, $10^h 41^m$, U.T. 3-minute exposure. IIaO + GG13. Note the many fine streamers around the coma on this blue plate.

Figure 16. Photograph of Comet West by Bill Keel on April 2, 1976 at $9^h\ 34^m$, U.T. 5-minute exposure with 60-cm. telescope at Dyer Observatory. IIaD + GG14.

Figure 17. Drawing of Comet West (1975 n) by Professor Jean Dragesco. March 11, 1976, 4^h 50^m, U.T., 11 x 80 Tordalk Binoculars, at Clermont-Ferrand, France. The thin gas tail is on the right, and the dust tail has two bright parts. There is also a fainter plume to the left. With 7 x 42 binoculars Professor Dragesco estimated the comet's head to be stellar magnitude 2.8 by comparing it to stars whose magnitudes are given in Vehrenberg's <u>Handbook of the Constellations</u>.

Figure 18. Drawing by Jean Dragesco of the multiple nucleus of Comet West on March 29, 1976 at 4^h 15^m, U.T. Used a Celestron 8.

Figure 19. Drawing by Jean Dragesco of the split nucleus of Comet West on April 9, 1976 at 3^h 58^m, U.T. Made with a Celestron 8. Compare to Figures 9 and 14, which are views on April 10.

Figure 20. Photograph of Comet West by Jean Dragesco on May 7, 1976. Observed at Clermont-Ferrand, France. 400-mm., f/5 lens. 103 a O film. Exposure 10 minutes.

BOOK REVIEWS

The New Guide to the Stars, by Patrick Moore. W.W. Norton and Co., New York, N.Y., 1974. 250 pages. Price $9.95.

Reviewed by Phillip Budine

This book is an excellent, readable, and accurate account of the starry universe. It is written in a smooth, enjoyable, and informative style, as are all of Patrick Moore's fine works.

The contents include the following: The Distances to the Stars, The Constellations, The Life of a Star, Double Stars, Variable Stars, Exploding Stars, Pulsars, Black Holes, Clusters of Stars, Nebulae, The Galaxy, and The Outer Galaxies.

Mr. Moore has used many concise and clear examples and methods of illustrating various concepts about the stars. In the chapter on the Suns of Space on page 14, he uses an illustration of a one-inch line to represent the distance between the Earth and the Sun. Then he states that the nearest star will be over four miles away! On page 28 of the unit Guide to the Stars, he compares magnitudes of stars with the scale used by golfers: for example, handicaps and scratch positions.

The Appendix includes tables and information on: The Constellations, The Brightest Stars, The Nearest Stars, Some Interesting Double Stars, Some Interesting Variable Stars, Recent Naked-Eye Novae, Some Conspicuous Clusters and Nebulae, and Equipment for the Amateur Observer.

This book is bound in a hard cover and is illustrated with photos and diagrams. It will serve as a good guide to the stars for the amateur, and I highly recommend a copy of it for your bookshelf.

* *

1976 Yearbook of Astronomy, edited by Patrick Moore. Sidgwick and Jackson Ltd., London, and W.W. Norton and Company Inc., 500 Fifth Avenue, New York 10036, 1976. 215 pages. Price $9.95.

Reviewed by Richard J. Wessling

Patrick Moore's 1976 edition of the Yearbook is the fifteenth such edition published. As in the past, it is divided into four parts with the first part relating specifically to star charts, special events, the planets, Moon phases, and other timely items for 1976. Part two consists of articles, with the addition of, as Patrick Moore puts it "... one rather more technical article - David Block's contribution about Black Holes." Part three is for stellar observers, while part four is titled "miscellaneous" and briefly reviews some recent books. It also provides some background material about the various authors.

In part one, the star charts are presented in a manner which may be confusing to novice observers, while the monthly notes, starting for January on page 56 and continuing through December on page 108, are very practical and helpful. Also covered are the Moon phases for each month in a very useful diagram on page 55. Anyone responsible for planning stargazes for local clubs or personal observing schedules will welcome these valuable aids.

In the article section, Mariner 10 to Venus and Mercury is covered by H.G. Miles. The most interesting article to me is "Sense About Stellar Photography" by W.E. Pennell. In this article the author examines, in typical English style, what groundwork is necessary to accomplish successful stellar photography. The basics about the telescope mounting, camera and films, alignment, and exposure times are extremely well written and reflect the practical experience of the author. The only photographs in the book are found in this article, which consists of illustrations of instruments and telescope details. One photographic sample of the author's work, a fine photograph of the Orion Nebula, is included. For those wishing to construct their own telescope, or improve their present instrument, this article will prove to be quite helpful.

This fifteenth edition of the Yearbook would be a worthwhile addition to any amateur's library. Although the content is barely above the basics, the depth of personal experience is felt, while the details of how and why are left to the reader's imagination.

* *

Growth Rhythms and the History of the Earth's Rotation, edited by G.D. Rosenberg and S.K. Runcorn. John Wiley and Sons, One Wiley Drive, Somerset, N.J. 1975. 560 pages. Price $57.00.

Reviewed by Dr. Joel W. Goodman, Professor of Microbiology

This volume comprises the proceedings of a conference held at Newcastle-upon-Tyne in January, 1974 on a fascinating subject: paleontological clocks. Geophysicists have long surmised that the Earth's rotation must be slowing due to tidal friction, but the precise rate of deceleration has been difficult to ascertain. Estimates based on theory range from about 1.8 to 3.6 milliseconds per century. In the longest article of the book, astronomical observations dating back to 1375 B.C. are analyzed and indicate a constant deceleration rate for the past three millennia of 2.5 milliseconds per century.

In 1962, John W. Wells announced to the paleontological world that the number of days in an ancient year was recorded in the daily growth lines of fossil corals. This pronouncement had an immediate impact; the investigations of various fossils which followed comprise the marrow of the book. As the editors state in their concluding chapter: "The paleontological data are of central importance as they provide the only means of directly measuring the Earth's angular momentum and moment of inertia in the distant past". Given this salutary yardstick with which to work, we might anticipate that the issue would quickly be settled. Not so. The fossil evidence has confirmed that the day is indeed growing longer (a Devonian year had 400 days), but has been less than conclusive on other important questions. One of the difficulties is that identifying and enumerating growth lines is very troublesome and often subjective. Optical microdensitometry is being brought to bear on this problem and should allow for a greater degree of rigor and more meaningful numbers. Even when reliable numbers are obtained, however, how will they be interpreted? It appears that some species of invertebrates have band patterns synchronized to the 24.0 hour solar day, others to the 24.8 hour lunar day, a third group to both of these independently with consequent periodic interference of bands, and still others to rhythms of as yet unidentified origin. Hence, interpretation of banding patterns is far from unambiguous. The technical problems may be responsible for some puzzling observations. For example, paleontological evidence suggests at face value that for a period of about 10^8 years during the Mesozoic Era the Earth's rotation period actually accelerated. This, of course, cannot possibly be accounted for by the dissipative action of tidal friction. Over the long haul (geologically speaking), however, the paleontological clock is in reasonable agreement with geophysical predictions and recent astronomical records.

Of perhaps greater interest to astronomers is the consideration by several authors of possible mechanisms for altering the speed of the Earth's rotation. A variety of ways in which this might occur are discussed in lively fashion, including global expansion on the order of several hundred kilometers, coupling of the core to the mantle (related to Harold Urey's idea that changes in the length of the day may be linked to changes in the moment of inertia caused by core growth), a "cosmological drag force" postulated by Hubble's law, the sunspot cycle and solar tides, and, finally, the improbable speculation that deep oceans did not exist in geologically ancient times, thereby increasing lunar tidal torque. None of this material leads to very definitive conclusions, but it does make for entertaining reading.

This highly specialized collection of papers is obviously not for everyone, being aimed primarily at geophysicists and paleontologists. The size of its potential market is reflected by its $57 price tag, a steep figure for a volume of 560 pages, even by today's inflated standards. Although its cost is prohibitive for most ordinary mortals, those interested in the subject will find it worth tracking down at university or public libraries.

* *

Graze Observer's Handbook, by Harold R. Povenmire. Vantage Press, 516 West 34th Street, New York, N.Y., 1975. 134 pages. Price $4.95.

Reviewed by Joan Bixby Dunham and David W. Dunham, President, I.O.T.A.

Povenmire's book is the first about grazing occultations in English. It gives the basic information needed for setting up a graze expedition, including many observing hints and useful anecdotes. The author's long series of graze observations shows that his methods are successful and that his experience is of some value to beginning observers.

The book begins with an interesting account of the most successful graze expedition, which was led by the author in 1970, and some useful general information in Chapter 2. Unfortunately, after that the book is not organized very well and contains many errors. One would think that the publisher would take some steps to edit out several spelling and grammatical mistakes. They don't appear to have much regard for how well the book sells, an important point for the author, who would like to recover the major portion of the considerable sum he has paid for the publication.

A few more diagrams would have helped considerably in some places. Povenmire omits references in order "not to endorse any persons or products" (Foreword), and the Bibliography on pp. 127-128 is rather scanty and inadequate for those who want to read more about occultation work. Although it is wise to delete brand names and references to situations which are embarrassing to certain individuals, there are many other places where references would be valuable for those interested in more details.

It would take too much space to correct all the scientific errors. Some of the most important ones which we feel must be mentioned are listed below. On page 110, the statement is made that "two major institutions endorse the program-University of Texas and USNO". Royal Greenwich Observatory should replace the University of Texas. The University of Texas is no longer involved with graze occultations. Mr. Povenmire's advocation of railroad tracks as an observing site (pp. 54-55) is an invitation to disaster. The use of railroad tracks should be discouraged except when there is absolutely no alternative, and then the permission of the railroad must be sought. Anyone following Mr. Povenmire's instructions on photographing grazes (Chapter 16) will have a hard time. He defines the ecliptic plane as "the plane extending from the sun's center out through its equator into space" (p. 117). The ecliptic plane is the orbital plane of the Earth, to which the Sun's equator is inclined 7°. From p. 34, "Stars of very large proper motion are not very useful because their position is too uncertain." This is not true. If the proper motion is known accurately, it doesn't matter what is the size, the star's position can still be judged accurately. The WWV and WWVH stations no longer have silent periods as described on page 65. The 29th second beat, not the 30th one, is skipped.

It is difficult to publish up to date scientific information about obtaining occultation information due to the fast changing situation in recent years. Unfortunately, major changes in the prediction procedures (especially computer-produced profiles and formation of the International Occultation Timing Association, I.O.T.A.) occurred just after Povenmire's book went to press. In addition, total and graze occultations should no longer be sent to the U.S.N.O. or to the University of Texas, as stated on pages 19 and 22.

The book does not serve very well as a handbook for observers. It is largely a collection of opinions and anecdotes of one observer, who is enthusiastic and experienced; but it does not have a strong scientific background. However, for the time being, the author has cornered the English-speaking market. I.O.T.A. is preparing what promises to be a more useful graze manual for those interested in the field.

* *

The UFO Controversy in America, by Dr. David Michael Jacobs. Indiana University Press, Bloomington, Indiana 47401. 1975. 362 pages. Price $12.50.

Reviewed by Rodger W. Gordon

Dr. Jacobs' book is the first book devoted to the history of the UFO's; and in the opinion of the reviewer, he has done very well. In writing the book, the author has had access to many data not available to the layman or to most UFO investigators. The information given makes this book an important document for any UFO researcher or scientist who needs a broad overview of the subject.

Dr. Jacobs appears to be quite fair in his treatment of both the pro and con viewpoints. However, judging from his writings, he may lean toward the pro side.

After reading this book, the reviewer thinks definitely that bona fide science missed a golden opportunity to investigate the subject in a rational way in the 1948-1952 period. This era was before the cult groups and the "contactees" got hold of the subject, embraced it for all its worth, and kept respectable scientists away in droves.

If a scientist picks up this book and reads it with an open mind, he can't help but say, "What's going on here? This seems to require further investigation".

As a source book, this volume is remarkably complete. The only major omission is that nothing is said of Morris K. Jessup, who wrote two books on the subject in the middle 1950's. He wrote his books with an eye to the unusual anomalies which science tends to ignore because they do not fit with current theories. Officially, Mr. Jessup committed suicide in 1959. He was found in a closed barn with a car engine running. However, rumor has it that the door was locked from the outside.

Many of the "classic" books on the UFO subject are now unobtainable, and many of the newer books do not cover the historical period in sufficient depth. Dr. Jacobs' book is an effective remedy for both of these situations.

* *

Role of Magnetic Fields in Physics and Astrophysics, V. Canuto, Editor. New York Academy of Sciences, New York, N.Y. 1975. Annals of the New York Academy of Sciences, Vol. 275. 226 pages. Price $24.00 paperback.

Reviewed by A. Konradi, NASA, Lyndon B. Johnson Space Center

This book represents a collection of papers given at a conference with the same title, June 5-7, in Copenhagen, Denmark. The stated purpose of the conference was to bring together people "... who had performed beautiful work on the properties of matter under unusually large magnetic fields".

Work in this branch of physics has received a strong impetus with the discovery of pulsars and their interpretation as collapsed neutron stars with surface magnetic fields of the order of 10^{13} gauss. This book contains twenty papers ranging from polished reviews of several leaders in the field to short reports on current research. In dealing with the properties of very strong magnetic fields, the papers treat subjects such as quantum electrodynamics (both theory and experimental checks in megagauss fields), radiation problems, Compton scattering, polarization and electromagnetic properties of vacuum, and quantum processes. Other papers discuss experimental efforts to create megagauss fields as well as astrophysical evidence for, and observation of, strong magnetic fields in pulsars and white dwarfs. Several papers are devoted to the theory of mechanisms responsible for the generation of magnetic fields in astrophysics and to the state of matter in the presence of extremely strong magnetic fields.

Professor Wheeler presents a breath-taking view of physical laws and their meaning and limitations in the light of the big bang and ultimate gravitational collapse; and Professor Alfvén in a highly readable, non-mathematical paper again warns about the danger of substituting plasma theories amenable to solution for hard but puzzling experimental observations. He again stresses that so many of our basic assumptions underlying the present view of the universe are as yet unsubstantiated and indeed may be fallacious.

For a dilettante with the necessary mathematical background or a graduate student thinking of entering the field of astrophysics, this book is an excellent introduction to some of the most exciting aspects of the subject; for a professional, the book is a fine summary of the current state of knowledge in this rapidly changing field.

* *

The Amazing Universe, by Herbert Friedman. National Geographic Society, Washington, D.C. 20013, 1975. 199 pages. Price $4.25 hardback.

Reviewed by J. Russell Smith

This volume is by an outstanding astronomer, who has given the reader an up-to-date survey of stellar astronomy. The publisher has used the same format as the National Geographic magazine - the same fine grade of paper and many excellent photographs in color.

The reading level is considered to be for those who have had some elementary astronomy. The reviewer became so absorbed in the book that he read it in one afternoon.

The Table of Contents lists the following chapters: "The Lure of the Heavens", "To the Edge of the Universe", "Our Star the Sun", "The Family of Stars", "Stellar Beacons and Black Holes", "Realms of the Galaxies", "The Cosmic Order", and "The Search for Life". These are followed by a glossary, an excellent index, and a listing of additional reading.

The book is a bargain at $4.25; and when you see it, I think you will agree.

* *

Children of the Universe, by Hoimer Von Ditfurth, translated from the German by Jan Van Heurck, 1974. 301 pages, hard cover, Atheneum Publishers, New York. Price $10.95.

Reviewed by Harry Grimsley

This book explores the idea that all things, whether stars or living creatures, wherever found in the universe, are related to each other because they are made of the same raw materials. Professor Von Ditfurth, well known in Germany. uses his sound grasp of astronomy and physics to weave an exciting tale of where things came from, why, and where they are going. Some of his word pictures have the grandeur of Genesis, and all have the reasoning of modern science. His explanations, whether of black holes, Moon brake, solar wind, or quasars, grip the reader's interest and provide believable answers to the why of many apparently isolated and puzzling phenomena.

Prepared for popular consumption, this book is meat for anyone to chew on and is well worth the price tag.

ADDITIONS TO THE A.L.P.O. LUNAR PHOTOGRAPH LIBRARY: MEMBER AND APOLLO-17 PHOTOGRAPHS

By: John E. Westfall, A.L.P.O. Lunar Recorder

Recent additions to the A.L.P.O. Lunar Photograph Library consist of 170 eight-by-ten inch black and white prints from the following sources:

25 photographs by John Sanford (8-in. & 12-in. Refls.; JS code No.).
2 photographs by Richard Wessling (RW code number).
143 Apollo-17 photographs from lunar orbit, supplied by NASA-NSSDC.

Samples of Mr. Sanford's and Mr. Wessling's photographs are included as illustrations in this report (Figures 21 and 22), and demonstrate the highly-useful photographs that capable A.L.P.O. members are encouraged to contribute to our library; large-scale 8x10-inch original prints such as these are particularly welcome.

A.L.P.O. members interested in lunar studies are reminded that the Lunar Photograph Library exists to loan them lunar photographs. If you wish the loan of particular photographs, or photographs of a particular lunar region, send a request with 50 cents in stamps (to cover postage) to:

Dr. John E. Westfall
Department of Geography
San Francisco State University
1600 Holloway Avenue
San Francisco, CA 94132

Table 1. A.L.P.O. Member Photographs

Note: Under "Scale," M refers to millions (e.g., 4.5M = 1/4,500,000).

Code Number	Area Covered	U.T. Date & Time	Colong.	Scale
JS-1	Clavius-Theophilus-Mts. Apenninus	1971 Jul 13,----	c.155°	9.0M
JS-2	Arzachel-N.Limb-Aristarchus	1971 Oct 10,1000	162.0	9.9M
JS-3	Copernicus-S.Limb-Maurolycus	1971 Oct 10,1000	162.0	9.4M
JS-4	Hell-N.Limb-W.Limb	1971 Oct 11,1200	175.2	11.7M
JS-5	Copernicus-S.Limb-Walter	1971 Oct 11,1200	175.2	9.6M
JS-6	Pitatus-Sinus Medii	1971 Oct 11,1200	175.2	4.2M
JS-7	E.Limb-Nearch-Geminus	1972 Jan --,----	c.330	11.2M
JS-8	M.Tranquillitatis-M.Fecunditatis-S.Limb	1972 Jan 23,0145	355.6	10.3M
JS-9	Kepler-Aristarchus-Gruithuisen (reversed)	1972 Jan 28,0715	059.1	4.5M
JS-10	M.Tranquillitatis-M.Serenitatis-N.Limb	1972 Mar 22,0400	354.7	8.0M
JS-11	Langrenus-M.Crisium-M. Smythii-M.Marginis (reversed)	1972 May 23,0405	031.2	7.1M
JS-12	S.Aestuum-M.Imbrium-M.Serenitatis-N.Limb	1972 Sep 17,0430	020.8	7.9M
JS-13	M.Tranquillitatis-M.Fecunditatis-M.Crisium	1972 Dec 22,0840	111.6	7.2M
JS-14	Sinus Medii-Tycho-S.Limb	1973 --- --,----	c.015	7.8M
JS-15	M.Crisium-Theophilus-E.&S.Limbs	1973 Mar 10,0215	337.3	9.9M
JS-16	Theophilus-M.Tranquillitatis-M.Serenitatis-N.Limb	1973 Mar 12,0330	002.3	9.5M
JS-17	M.Tranquillitatis-Ptolemy-S.Limb	1973 Mar 12,0330	002.3	8.9M
JS-18	M.Nubium-M.Humorum-Tycho	1973 Mar 16,0630	052.5	7.2M

Table 1. A.L.P.O. Member Photographs (cont.)

Code Number	Area Covered	U.T. Date & Time	Colong.	Scale
JS-19	Ptolemy-M.Imbrium-N.Limb	1973 Nov 16,1315	165.6	9.2M
JS-20	Ptolemy-M.Vaporum-Archimedes	1973 Nov 16,1315	165.6	5.6M
JS-21	Aristarchus-M.Nubium-S.Limb	1973 Nov 16,1315	165.6	10.9M
JS-22	Ptolemy-Schickard-S.Limb	1973 Nov 16,1315	165.6	7.6M
JS-23	Theophilus-E.&S.Limbs	1973 Dec 01,0125	342.4	10.1M
JS-24	M.Humorum-Longomontanus-Bailly	1974 Jul 13,1230	197.7	6.2M
JS-25	Kepler-Grimaldi-Bailly	1974 Jul 13,1235	197.7	10.1M
RW-16	Lubiezky-Gassendi	1975 Jun 20,0200	041.1	2.0M
RW-17	Copernicus-Mts.Carpatus	1975 Jun 20,0225	041.3	3.3M

Table 2. Apollo-17 Photographs

Notes: (a) Format: M designates the metric camera, H the Hasselblad camera, and N the Nikon 35mm camera. V indicates a vertical or near-vertical view, H a high oblique (horizon shown), and L a low oblique (below horizon). The direction of view of obliques (N = north, etc.) is also given. Note that metric camera high oblique views are wide-angle views which show the Moon's surface from the nadir (directly below the camera) to the horizon.

(b) Sun Angle: H indicates high, M medium, and L a low Sun. T refers to the terminator and E indicates an earthlight photograph.

(c) Scale: M refers to millions and T to thousands (e.g., 1.2M = 1/1,200,000 and 930T = 1/930,000). Due to foreshortening, scales are not given for oblique views.

(d) Description: The principal named features shown are listed, followed by the longitude/latitude of the photograph center. Photographs forming part of a strip series (e.g., "#4 of 29") or otherwise overlapping other photographs, are noted. With a strip series, each photograph overlaps the preceeding, and the following, photograph. With metric vertical views, overlap areas may be viewed stereoscopically. Further data on strip coverage are given at the end of this report.

(e) Three representative Apollo-17 photographs (Figures 23,24, and 25) are given as illustrations to this report. The period of lunar orbit for Apollo-17 was December 10-16, 1972.

Code Number	Format	Sun Angle	Scale	Description
AS17-				
258	MV	H	1.8M	M.Marginis-Jansky-Ibn Yunus.(93°E/12°N)(#1 of 10)
264	MV	H	1.8M	M.Marginis-Goddard.(86°E/15°N)(#2 of 10)
270	MV	H	1.8M	Hansen-Alhazen.(78°E/16°N)(#3 of 10)
276	MV	H	1.8M	Hansen-M.Anguis.(71°E/18°N)(#4 of 10)
282	MV	M	1.8M	NE M.Crisium-Eimmart B,C,H,K.(64°E/19°N)(#5 of 10)
288	MV	M	1.8M	W M.Crisium-Picard-Eimmart C.(56°E/19°N)(#6 of 10)
294	MV	M	1.9M	Macrobius-Proclus-Yerkes.(49°E/20°N)(#7 of 10)
300	MV	M	2.0M	Macrobius-Römer-Maraldi D.(41°E/20°N)(#8 of 10)
306	MV	L	2.1M	LeMonnier-Römer-Vitruvius.(34°E/20°N)(#9 of 10)
312	MV	L-T	2.2M	Dawes-Jansen-Vitruvius-LeMonnier.(26°E/20°N)(#10 of 10)
441	MV	M	940T	Macrobius A,B-Römer J-Maraldi F.(39°E/20°N)(#1 of 5)
445	MV	M	940T	Littrow-Maraldi-Vitruvius.(33°E/20°N)(#2 of 5)
449	MV	L	930T	Dawes-Mt.Argaeus-LeMonnier C.(27°E/20°N)(#3 of 5)
453	MV	L	930T	Bessel-Deseilligny-Rima Plinius II.(22°E/19°N)(#4 of 5)
457	MV	L-T	900T	Bessel-Bessel E-Menelaus A.(15°E/19°N)(#5 of 5)
796	MV	M	920T	Dawes-Mt.Argaeus-LeMonnier C.(28°E/20°N)(#1 of 5)
800	MV	M	920T	Deseilligny-Rima Plinius II.(22°E/20°N)(#2 of 5)
804	MV	L	900T	Bessel-Bessel E-Sulpicius Gallus BB.(16°E/20°N)(#3 of 5)
808	MV	L	890T	Sulpicius Gallus-Mts.Haemus.(11°E/20°N)(#4 of 5)
812	MV	L-T	840T	Manilius E-Mts.Haemus.(05°E/20°N)(#5 of 5)

(text continued on page 66)

Figure 21. Sunset on Mare Crisium, photographed by A.L.P.O. member John Sanford, using an 8-inch Celestron reflector, on December 22, 1972. The terminator, at Colong. 111°.6, is shown from Langrenus (upper left) to Endymion (lower right). South at top. (A.L.P.O. Lunar Photograph Library photograph JS-13.)

Figure 22. This lunar photograph includes Eratosthenes, Copernicus, Kepler, and the Carpathian Mountains, as taken by A.L.P.O. member Richard Wessling on June 20, 1975, at Colong. 041°3. South at left. (Photograph No. RW-17.)

Figure 23. A vertical lunar photograph by the Apollo-17 metric camera at Colong. 037°, showing the crater Euler (bottom) and the isolated mountain Euler Beta, 1,100 meters high. North at right; frame approximately 180 kms. square. (Photograph AS17-2731.)

Table 2. Apollo-17 Photographs (cont.)

Code Number	Format	Sun Angle	Scale	Description
AS17,				
890	MH-N	H	----	Erro-Dreyer-Moiseev.(98°E/07°N)(#1 of 18)
894	MH-N	H	----	Jansky-Goddard-Dreyer.(93°E/08°N)(#2 of 18)
898	MH-N	H	----	E M.Marginis-Goddard.(88°E/11°N)(#3 of 18)
902	MH-N	H	----	W M.Marginis-Goddard.(83°E/12°N)(#4 of 18)
906	MH-N	H	----	Alhazen-Cannon.(77°E/14°N)(#5 of 18)
910	MH-N	H	----	Hansen-M.Anguis.(72°E/16°N)(#6 of 18)
914	MH-N	H	----	NE M.Crisium-M.Anguis.(67°E/17°N)(#7 of 18)

Table 2. Apollo-17 Photographs (cont.)

Code Number	Format	Sun Angle	Scale	Description
AS17,				
918	MH-N	H	----	N M.Crisium-Eimmart.(62°E/18°N)(#8 of 18)
922	MH-N	H	----	NW M.Crisium-Peirce-Cleomedes.(55°E/20°N)(#9 of 18)
926	MH-N	H	----	Macrobius-Cleomedes.(49°E/21°N)(#10 of 18)
930	MH-N	M	----	Macrobius-Newcomb.(44°E/22°N)(#11 of 18)
934	MH-N	M	----	Römer-Mts.Taurus.(38°E/23°N)(#12 of 18)
938	MH-N	M	----	Littrow-Posidonius-Römer.(32°E/23°N)(#13 of 18)
942	MH-N	M	----	E M.Serenitatis-Posidonius.(26°E/23°N)(#14 of 18)
946	MH-N	M	----	Bessel-Center M.Serenitatis.(20°E/24°N)(#15 of 18)
950	MH-N	L	----	W.M.Serenitatis-Linné-Mts.Caucasus.(14°E/23°N)(#16 of 18)
954	MH-N	L-T	----	Mts.Haemus & Caucasus.(07°E/23°N)(#17 of 18)
958	MH-N	L-T	----	Conon-Mts.Apenninus.(02°E/22°N)(#18 of 18)
1232	MV	L	880T	Sulpicius Gallus-Mts.Haemus.(12°E/20°N)(#1 of 3)
1236	MV	L	850T	Manilius E-Aratus A-Mts.Haemus. (07°E/20°N)(#2 of 3)
1240	MV	L-T	840T	Conon-N M.Vaporum.(01°E/20°N)(#3 of 3)
1604	MH-S	H	----	Wyld-Hirayama.(98°E/03°S)(#1 of 20)
1608	MH-S	H	----	Purkyne-Hirayama-E M.Smythii.(93°E/01°S)(#2 of 20)
1612	MH-S	H	----	M.Smythii.(88°E/00°N)(#3 of 20)
1616	MH-S	H	----	Schubert-Kästner-W M.Smythii.(83°E/02°N)(#4 of 20)
1620	MH-S	H	----	Schubert-Gilbert.(77°E/04°N)(#5 of 20)
1624	MH-S	H	----	E M.Undarum-Schubert Y.(73°E/06°N)(#6 of 20)
1628	MH-S	H	----	M.Undarum-M.Spumans.(67°E/07°N)(#7 of 20)
1632	MH-S	H	----	SE M.Crisium-Azout-Apollonius.(62°E/09°N)(#9 of 20)
1636	MH-S	H	----	S M.Crisium-N M.Fecunditatis.(56°E/10°N)(#9 of 20)
1640	MH-S	H	----	SW M.Crisium-Yerkers-Taruntius.(51°E/12°N)(#10 of 20)
1644	MH-S	H	----	Proclus G-Taruntius.(45°E/13°N)(#11 of 20)
1648	MH-S	H	----	Franz-Cauchy-NE M.Fecunditatis.(40°E/14°N)(#12 of 20)
1652	MH-S	M	----	Vitruvius A-Sinas-NE M.Fecunditatis.(34°E/15°N)(#13 of 20)
1656	MH-S	M	----	Dawes-Jansen-Vitruvius.(28°E/16°N)(#14 of 20)
1660	MH-S	M	----	Pr.Acherusia-Plinius-Arago.(23°E/16°N)(#15 of 20)
1664	MH-S	M	----	S M.Serenitatis-Menelaus-J.Caesar.(17°E/17°N)(#16 of 20)
1668	MH-S	M	----	Sulpicius Gallus-Manilius-J.Caesar.(11°E/17°N)(#17 of 20)
1672	MH-S	L	----	M.Vaporum-Manilius-Hyginus.(05°E/17°N)(#18 of 20)
1676	MH-S	L-T	----	Mts.Apenninus-Marco Polo-W M.Vaporum.(00°E/17°N)(#19 of 20)
1680	MH-S	L-T	----	W Mts.Apenninus-E Sinus Aestuum.(07°W/17°N)(#20 of 20)
1819	MV	M	860T	Manilius E-Rimae Sulpicius Gallus-Mts.Haemus.(08°E/20°N)(#1 of 5)
1822	MV	L	840T	Conon-Aratus A-Manilius E.(04°E/20°N)(#2 of 5)
1825	MV	L	850T	Conon-Mt.Huygens-Mt.Bradley. (00°E/20°N)(#3 of 5)
1828	MV	L	840T	Mt.Wolff-Mt.Huygens-Wallace A,B,K.(04°W/20°N)(#4 of 5)
1831	MV	L-T	840T	Wallace-Wallace A,K-Eratosthenes A,B.(08°W/19°N)(#5 of 5)
2107	MV	M	890T	Conon-Rima Hadley-Aratus.(03°E/23°N)(#1 of 5)
2111	MV	L	910T	Archimedes N-Rima Bradley-Mt.Huygens.(03°W/23°N)(#2 of 5)
2115	MV	L	920T	Wallace-Timocharis K-Archimedes E,F,H,W.(08°W/23°N)(#3 of 5)
2119	MV	L	930T	Timocharis A,C,D,E-Pytheas H,K.(14°W/22°N)(#4 of 5)
2123	MV	L-T	930T	Pytheas-Pytheas G,M,U-Timocharis E.(19°W/22°N)(#5 of 5)
2279	MV	M	920T	Wallace-Archimedes E,F,H-Timocharis K.(10°W/23°N)(#1 of 5)
2283	MV	L	910T	Timocharis A,C,D,E-Pytheas G,H.(15°W/23°N)(#2 of 5)

Figure 24. An oblique photograph by the Apollo-17 metric camera, looking north over the lunar Apennines, with Mare Serenitatis to the bottom and Mare Imbrium to the top. In the upper right, the Sun is rising on the craters Autolycus and Aristillus (Colong. 358°). The Sulpicius Gallus system of rills is visible on the lower left. (Photograph AS17-954.)

Table 2. Apollo-17 Photographs (cont.)

Code Number	Format	Sun Angle	Scale	Description
AS17,				
2287	MV	L	920T	Lambert-Lambert R-Pytheas.(21°W/23°N)(#3 of 5)
2291	MV	L	920T	Euler-Euler F,G,L-Pytheas W.(26°W/23°N)(#4 of 5)
2295	MV	L-T	920T	Euler-Euler L,K,P-Brayley D.(32°W/22°N)(#5 of 5)
2429	MH-S	M	----	Conon-M.Vaporum-S.Aestuum.(01°E/19°N)(#1 of 7)

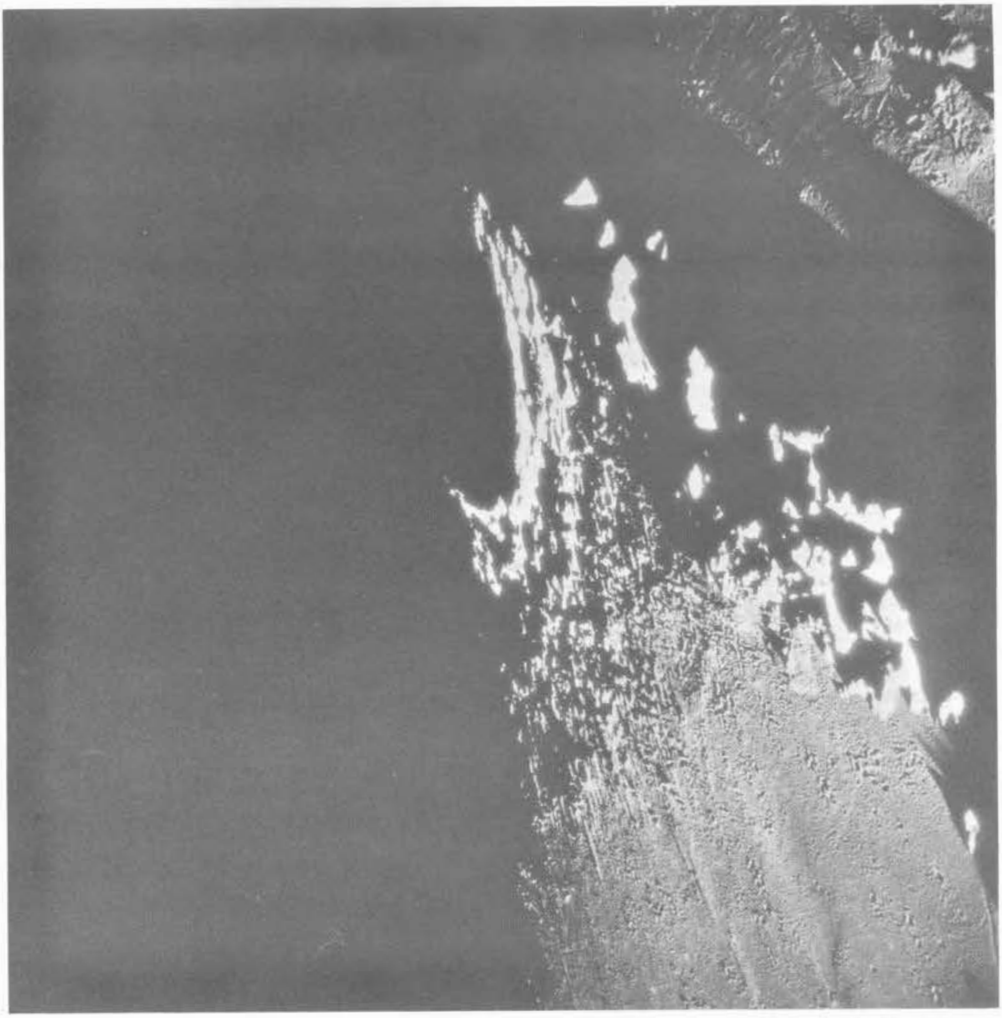

Figure 25. Sunrise on the crater Eratosthenes, photographed with the 250mm lens of the Apollo-17 Hasselblad camera. Note the pattern of ejecta from the crater Eratosthenes in the center right. The direction of view is to the south. (Photograph AS17-23590.)

Table 2. Apollo-17 Photographs (cont.)

Code Number	Format	Sun Angle	Scale	Description
AS17,				
2433	MH-S	M	----	Wallace-Eratosthenes-S.Aestuum.(06°W/20°N)(#2 of 7)
2437	MH-S	M	----	Wallace-Eratosthenes-Copernicus.(11°W/20°N)(#3 of 7)
2441	MH-S	M	----	Pytheas-Eratosthenes-Copernicus.(17°W/20°N)(#4 of 7)
2445	MH-S	L	----	Pytheas-Mts.Carpatus-Copernicus.(23°W/20°N)(#5 of 7)
2449	MH-S	L	----	Euler P-Tobias Mayer-Copernicus.(29°W/19°N)(#6 of 7)

Table 2. Apollo-17 Photographs (cont.)

Code Number	Format	Sun Angle	Scale	Description
AS17,				
2453	MH-S	L-T	----	Brayley-Tobias Mayer-Milichius.(35°W/18°N)(#7 of 7)
2727	MV	L	940T	Euler-Euler F,G,H-Pytheas W.(26°W/23°N)(#1 of 3)
2731	MV	L	950T	Euler-Euler E,H,K,L,P-Brayley B,D,F.(31°W/22°N)(#2 of 3)
2735	MV	L-T	920T	Brayley-Brayley B,F-Euler E.(37°W/22°N)(#3 of 3)
2822	MV	H	890T	Gansky.(98°E/12°S)(#1 of 29)
2826	MV	H	890T	Hirayama-Brunner.(93°E/10°S)(#2 of 29)
2830	MV	H	890T	SE M.Smythii-Brunner.(88°E/08°S)(#3 of 29)
2834	MV	H	890T	M.Smythii.(83°E/06°S)(#4 of 29)
2838	MV	H	890T	Kästner-Gilbert.(79°E/04°S)(#5 of 29)
2842	MV	H	890T	Gilbert.(74°E/02°S)(#6 of 29)
2846	MV	H	890T	Maclaurin.(69°E/00°S)(#7 of 29)
2850	MV	H	890T	M.Spumans-Maclaurin T.(65°E/02°N)(#8 of 29)
2854	MV	H	890T	Apollonius-NE M.Fecunditatis.(60°E/04°N)(#9 of 29)
2858	MV	H	880T	Apollonius A,B,C,K,L,X.(55°E/06°N)(#10 of 29)
2862	MV	H	900T	Taruntius-Taruntius A,U-Lick N.(50°E/08°N)(#11 of 29)
2866	MV	H	910T	Taruntius-DaVinci-Lick N.(46°E/09°N)(#12 of 29)
2870	MV	H	900T	W M.Tranquillitatis-Cauchy-Lyell.(41°E/11°N)(#13 of 29)
2874	MV	H	900T	N M.Tranquillitatis-Cauchy A-Maraldi B.(36°E/13°N)(#14 of 29)
2878	MV	H	920T	N M.Tranquillitatis-Jansen-Jansen C,D,E,F,L,R.(31°E/15°N)(#15 of 29)
2882	MV	H	930T	Plinius-Jansen E-Dawes.(26°E/16°N)(#16 of 29)
2886	MV	H	960T	SE M.Serenitatis-Tacquet-Pr.Acherusia.(21°E/18°N)(#17 of 29)
2890	MV	H	950T	S M.Serenitatis-Menelaus-Bessel E.(15°E/19°N)(#18 of 29)
2894	MV	H	950T	SW M.Serenitatis-Sulpicius Gallus-Mts.Haemus.(10°E/20°N)(#19 of 29)
2898	MV	H	930T	Conon-Manilius E-Aratus.(05°E/21°N)(#20 of 29)
2902	MV	M	910T	Conon-Mt.Huygens-Mt.Bradley.(00°E/22°N)(#21 of 29)
2906	MV	M	950T	Wallace-Archimedes F-Wallace B.(06°W/22°N)(#22 of 29)
2910	MV	M	960T	Wallace-Timocharis C.(12°W/23°N)(#23 of 29)
2914	MV	M	950T	Pytheas-Lambert R-Timocharis A.(17°W/23°N)(#24 of 29)
2918	MV	M	950T	Pytheas-Lambert.(23°W/23°N)(#25 of 29)
2922	MV	M	960T	Euler-Euler G,H,P.(29°W/23°N)(#26 of 29)
2926	MV	L	960T	Brayley-Euler E-Brayley B,D,S.(34°W/23°N)(#27 of 29)
2930	MV	L	960T	Brayley-Aristarchus D-Bessarion D.(40°W/22°N)(#28 of 29)
2934	MV	L-T	970T	Bessarion D-Aristarchus-Aristarchus D.(45°W/22°N)(#29 of 29)
21283	H.H-N	M	----	Rima Hadley-Aristillus-Autolycus.(02°E/28°N)
22786	H.H-S	H	----	Neper-M.Smythii.(85°E/08°N)
22787	H.H-S	M	----	Azout-Webb.(64°E/12°N)
22792	H.H-S	M	----	Taruntius-N M.Fecunditatis.(48°E/09°N)
23265	H.H-S	L	----	Gay Lussac-Copernicus.(20°W/12°N)
23268	H.L-SW	L	----	Euler L,P.(30°W/20°N)(Overlaps AS17-23269)
23269	H.L-SE	L	----	Euler G-Tobias Mayer.(28°W/19°N)(Overlaps AS17-23268)
23508	H.L-N	M	----	LeMonnier B-Luther.(25°E/27°.5N)
23590	H.H-SW	L-T	----	Eratosthenes-N S.Aestuum.(06°W/14°N)
23600	H.H-SW	M	----	E M.Tranquillitatis-Cauchy.(38°E/10°N)
23640	H.H-S	M	----	W M.Tranquillitatis-Arago-J.Caesar.(19°E/13°N)
23641	H.H-N	L-T	----	Center M.Serenitatis-Linné A,B,D,E,F.(16°.5E/26°.5N)
23712	H.H-N	L-T	----	C.Herschel & east.(30°W/33°N)
23732	H.H-S	L	----	Tobias Mayer D-Hortensius.(28°W/12°N)(Overlaps AS17-23733)
23733	H.H-S	L	----	Tobias Mayer A-Milichius.(30°W/12°N)(Overlaps AS17-23732)

Table 2. Apollo-17 Photographs (cont.)

Code Number	Format	Sun Angle	Scale	Description
AS17,				
23745	H.H-S	L	----	Milichius A-Kunowsky.(33°W/12°N)(Overlaps AS17-23746)
23746	H.H-S	L	----	Kepler A-Encke.(35°W/12°N)(Overlaps AS17-23745)
23771	H.H-S	L	----	Kepler C-Maestlin R.(41°W/11°N)
23776	H.H-S	L-T	----	Marius D-Suess D.(46°W/11°N)
23845	N.L-W	L	----	Brayley S-Mts.Harbinger.(40°W/24°N)
23847	N.H-NW	L	----	Diophantus-Gruithuisen.(37°W/28°N)
23870	N.V	H-E	200T	Eratosthenes.(11°.5W/14°.5N)
23879	N.L	H-E	----	Copernicus.(20°W/10°N)
23897	N.L-N	H-E	----	Reiner Gamma.(59°W/07°.5N)
23901	N.H-S	L-E	----	Lacus Autumni-Mts.Rook.(83°W/13°S)(Overlaps AS17-23902, -23903,-24016)
23902	N.H-SW	L-E	----	Lacus Autumni-Mts.Rook.(82°W/13°S)(Overlaps AS17-23901, -23903)
23903	N.H-SW	L-E	----	Lacus Veris-Kopf.(87°W/16°S)(Overlaps AS17-23901,-23902, -24016)
24016	N.H-SW	L-E	----	M.Orientale-Kopf.(91°W/17°S)(Overlaps AS17-23901,-23903)

Table 3. Apollo-17 Strip Coverage

Code Number Range	Format	Longitude/Latitude Start Point	Longitude/Latitude End Point	Colong.	Number Frames	Scale
AS17-						
258-312	M.V	93°E/12°N	26°E/20°N	333°	10	1.8-2.2M
441-457	M.V	39°E/20°N	15°E/19°N	345°	5	900-930T
796-812	M.V	28°E/20°N	05°E/20°N	355°	5	840-920T
890-958	M.H-N	98°E/07°N	02°E/22°N	358°	18	--------
1232-1240	M.V	12°E/20°N	01°E/20°N	359°	3	840-880T
1604-1680	M.H-S	98°E/03°S	07°W/17°N	007°	20	--------
1819-1831	M.V	08°E/20°N	08°W/19°N	009°	5	840-860T
2107-2123	M.V	03°E/23°N	19°W/22°N	020°	5	890-930T
2279-2295	M.V	10°W/23°N	32°W/22°N	033°	5	910-920T
2429-2453	M.H-S	01°E/19°N	35°W/18°N	036°	7	--------
2727-2735	M.V	26°W/23°N	37°W/22°N	037°	3	920-950T
2822-2934	M.V	98°E/12°S	45°W/22°N	045°	29	880-970T

SECOND CONFERENCE OF JAPANESE JUPITER OBSERVERS

By: Takeshi Sato, past Director of Jupiter-Saturn
Section of the Oriental Astronomical Association

On October 12, 1975 the Second Conference of Jupiter observers in Japan was convened at the National Science Museum in Tokyo, and 43 active observers of the Giant Planet gathered there with their sketch books and photographic albums. In contrast to the First Conference of this kind, which had been held at the Sendai Municipal Observatory in 1974, only first class observers were invited to this gathering because of the small size of the meeting room.

At 10:00 a.m. the Conference was opened with a welcoming speech by Mr. Sadao Murayama of the National Science Museum; he is a past Director of the Jupiter Section of the Oriental Astronomical Association. Miss Hisako Koyama of the museum staff kindly served tea and cakes. She is a sunspot observer of great renown.

The following three papers were read in the forenoon:

1. "Some Considerations about the Bright Nuclei in the Northern Part of the Equatorial Zone", by Makoto Adachi, Kyoto. Mr. Adachi has observed several bright nuclei in the northern part of the EZ since 1973, and some of these objects are also shown on the Pioneer 11 close-up photographs. He suggested that these objects are probably eddies of ascending atmospheric gaseous masses, and he attempted to interpret in this way the interaction between these nuclei and the dark festoons. Discussion

followed.

2. "A Bubble-Like Rift in the South Temperate Belt", by Yuichi Iga, Osaka. A bubble-like rift in the STB was observed in 1974. Mr. Teruaki Kumamori first observed this object on April 20, 1974 as a shallow bay off the south edge of the STB. The bay in the belt became deeper and deeper as time passed, and by late May or June of 1974 it had become a bubble-like rift within the STB. Mr. Iga concluded from the observations that a bright object originated in the South Temperate Zone, moved toward the adjacent STB, and finally became the feature of his paper. He also discussed the process of fading of the STB in 1974 and 1975.

3. "An Easy Method of Making Color Composites of the Planets from Black and White Photographs", by Masaaki Watanabe, Tokyo. Mr. Reiichi Horiguchi read the paper in Mr. Watanabe's absence. The author photographs the planets on a black and white film through orange, green, and blue filters in rapid succession. (He does not use a red filter because the sensitivity of his photographic emulsion is poor in red light.) Then Mr. Watanabe makes a set of three black and white positive prints, each a composite from several black and white negatives taken with each color filter. Finally he copies these prints on a positive color film through red, green, and blue filters. He emphasized that his film-prints-film method is much easier for amateurs than the usual film to film method.

A number of breath-taking color photographs of Jupiter and Saturn obtained with Mr. Watanabe's 18-cm. (7-inch) reflector and with Mr. Horiguchi's 25-cm. (10-inch) reflector were projected upon the screen.

In the afternoon the then current 1975-76 apparition of Jupiter was actively and enthusiastically discussed.

1. South Equatorial Belt Disturbances. [The year 1975 saw the unique event of three major S.E.B. Disturbances. Mr. Elmer J. Reese of the New Mexico State University Observatory has kindly supplied the following dates and longitudes in System II of each initial outbreak: A, July 2, 68°; B, August 2, 213°; C, August 17, 123°. This interpretation was less clear when Mr. Sato wrote the text which follows. It must be appreciated that detail in the SEB components and the intervening SEBZ was extremely abundant and correspondingly confusing. - Editor.]

Unfortunately, the rainy season was in progress in Japan during the early stages of the first SEB Disturbance, and it was not until July 15 that Mr. Makoto Adachi first observed this feature at a longitude shortly following the Great Red Spot. On July 31 Mr. Haruki Suzuki observed a bright spot in the SEBZ at 206°(II), and on August 2 four observers recorded a dark column in the SEBZ at 209°(II). [This feature is presumably Disturbance B.] On August 11 Mr. Hiroshi Matsuda and two other observers recorded a dark column in the SEBZ at 166°(II), immediately preceded by a bright spot. On August 14 Mr. Makoto Adachi observed a dark column in the SEBZ at 120°(II). [This feature is presumably Disturbance C.]

Much discussion focused on the question of whether these objects belonged to a single SEB Disturbance or to as many as four distinct Disturbances, and the preliminary conclusion at that time (October 12, 1975) was that the latter interpretation was more probable than the single-Disturbance opinion. Thus Mr. Hirabayashi later proposed that the July 15 and August 2 dark columns were independent outbreaks and that the August 11 and August 14 dark columns were probably triggered by the SEB_n branch of the second SEB Disturbance [Reese's Disturbance B].

The interactions between the SEB Disturbances and the Great Red Spot were also actively discussed. It was pointed out that the retrograding SEB_s dark spots collided with the Great Red Spot in two groups, first a group of small spots in early September, and second a group of moderately large spots in the middle of September, 1975. By the time of the Conference on October 12 a group of large dark SEB_s spots had almost reached the Red Spot.

The Great Red Spot began to fade out over its northern half in the middle of September, probably due to the effect of the second group of SEB_s spots mentioned above. In late September many observers saw the SEB_s to run straight across the Great Red Spot, although Takeshi Sato raised the question of whether it was absolutely certain that the dark line in the Spot was part of the SEB_s.

2. Large Scale Activity in the North Temperate Belt, south component-North Tropical Zone. On September 16 and later many dark and bright features were observed in the NTB_s-NTrZ. Mr. Takeshi Sato suggested that such dark features were moving in the very rapid North Tropical Current C, which has a period of about 9 hrs., 48 mins. Mr. Isamu Hirabayashi agreed and suggested that the bright spots in the NTrZ were very probably drifting with the same rapid current. This opinion was later confirmed.

The Conference officially closed at 4:30 P.M., but informal discussion continued at a nearby coffee house up to the hour of the last train.

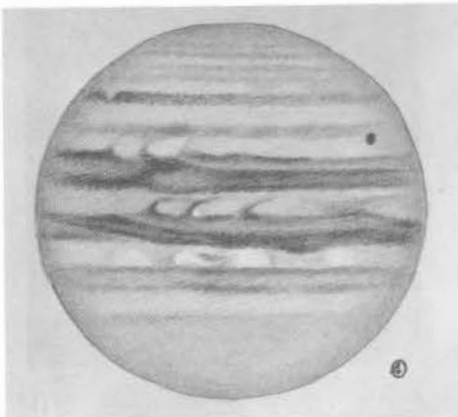

Figure 26. Drawing of Jupiter by Makoto Adachi on September 30, 1975 at 12 hrs., 46 mins., Universal Time. 20-cm. (8-inch) reflector, 268X. Seeing 7 on a scale of 0 to 10 with 10 best. Transparency 4 on a scale of 0 to 5 with 5 best. $CM_1 = 356°$ $CM_2 = 246°$ Note activity in South Equatorial Belt and North Tropical Zone. Figures 26-31 were all contributed by Takeshi Sato; all show Jupiter as a simply inverted image with south at the top. Note shadow of Jupiter I a little inside the right (following) limb.

Figure 27. Drawing of Jupiter by Isamu Hirabayashi on September 7, 1975 at 14^h 17^m, U.T. 20-cm. (8-inch) reflector, 235X. Seeing 8 to 5, transparency 3. $CM_1 = 17°$ $CM_2 = 82°$ Note the Great Red Spot near the left limb and the great activity in the South Equatorial Belt.

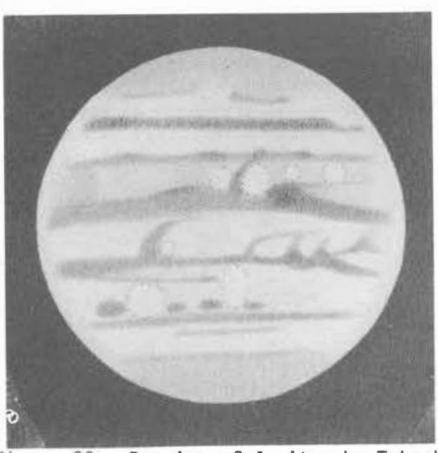

Figure 28. Drawing of Jupiter by Takeshi Sato on October 9, 1975 at 12^h 18^m, U.T. 15-cm. (6-inch) reflector, 192X. Seeing 3 to 4, transparency 4.5. $CM_1 = 321°$ $CM_2 = 143°$ Note activity in the South Equatorial Belt and the North Tropical Zone-North Temperate Belt.

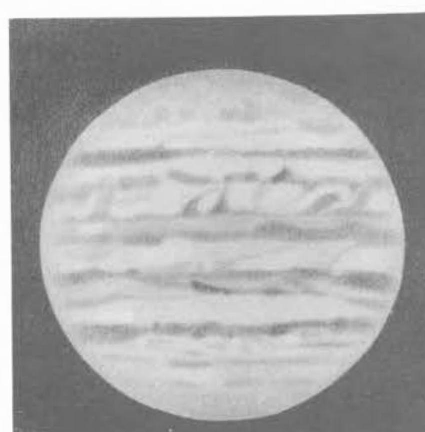

Figure 29. Pencil copy by Takeshi Sato of a composite color photograph of Jupiter by Masaaki Watanabe on September 2, 1975 at 16^h 56^m, U.T. 25-cm. (10-inch) reflector at equivalent f/175 (projected with orthoscopic 7-mm. eyepiece). $CM_1 = 44°$ $CM_2 = 146°$ Plus X film developed for 16 minutes by Pandol at 20°C. The original color transparency exhibits colors of individual features on Jupiter varying from grayish blue to brownish orange.

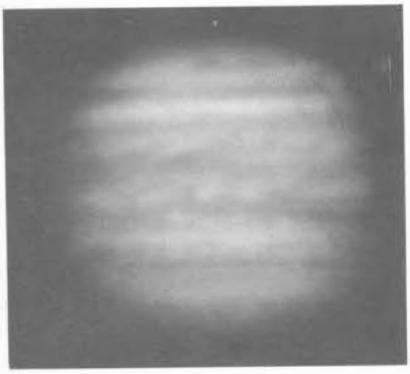

Figure 30. Photograph of Jupiter in integrated light by Tsuyoshi Arakawa, Nara City, Japan. 20-cm. (8-inch) reflector at equivalent f/300 (projected with 5-mm. orthoscopic eyepiece). October 13, 1975; $15^h\ 33^m$, U.T. Tri X film developed for 20 minutes with Pandol at 20°C. Exposure 1.5 seconds. $CM_1 = 352°$. $CM_2 = 143°$.

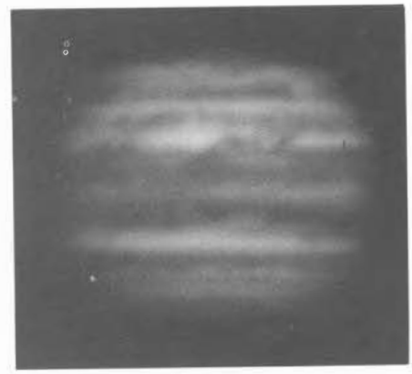

Figure 31. Photograph of Jupiter in blue light by Reiichi Horiguchi. 25-cm. (10-inch) reflector at equivalent f/192. 103a-0 film developed for 20 minutes with Pandol at 20°C. Exposure 1.5 seconds. August 31, 1975; 16 hrs., 6.5 mins., U.T. $CM_1 = 57°$. $CM_2 = 175°$.

Figure 32. Mr. Shinji Mizumoto of Tokyo discussing the interaction between the SEB Disturbances and the Great Red Spot. He is a chemical engineer and a very reliable visual observer of the planets. Figures 32-36 are photographs taken during the Second Conference of Japanese Jupiter Observers, all by Mr. Takeshi Sato.

Figure 33. Mr. Isamu Hirabayashi discussing the great activity in the North Temperate Belt, south-North Tropical Zone. He is a mechanical engineer and the Director of the Jupiter-Saturn Section of the Oriental Astronomical Association. He is also the President of the Japanese Lunar and Planetary Observers Network (JALPON).

Figure 34. Mr. Reiichi Horiguchi explaining Mr. Masaaki Watanabe's color composite photography. Mr. Horiguchi is a student of dentistry, a master of planetary photography, and an eagle-eyed visual observer.

Figure 35. An informal disucssion during the Second Jupiter Conference. Mr. Makoto Adachi seated at left and Mr. Yuichi Iga seated at right.

DARK-HALOED CRATERS: A CONCLUDING REPORT

By: Kenneth J. Delano, A.L.P.O. Lunar Recorder

Five years ago a program was initiated by the Lunar Section of the ALPO (JALPO, Vol. 23, Nos. 3-4) to study the Moon's dark-haloed craters. The best known of these objects are those within Alphonsus; but there are many others, usually less conspicuous than those in Alphonsus due to their smaller size or fainter appearance. The aims of the DHC Program were: 1) to discover as many craters as possible that have dark halos around them, 2) to confirm the existence of suspected DHCs, 3) to compile a catalog in which the sizes and shapes of the DHCs would be noted, 4) to determine any distribution patterns among the cataloged DHCs, 5) to record any dark rays lying within or radiating beyond the dark halos, 6) to determine how the intensities of the DHCs vary in the course of a lunar day, and 7) to look for any DHC-related lunar transient phenomena (LTP).

The primary goal was to compile as complete a list of DHCs as possible. Christopher Vaucher, Harry Jamieson, and I carefully examined three lunar atlases -- Kuiper's, Kopal's, and Alter's -- in order to draw up a preliminary list and to make it available to participants in the Program. John Westfall drew a set of 16 charts, on which he plotted all the confirmed and unconfirmed DHCs listed in the Program's 1972 catalog. It was hoped that ALPO observers would be able to discover more than the 400 DHCs upon which Salisbury, Adler, and Smalley had based their study in 1968 (MON. NOT. R. ASTR. SOC., Vol. 138, pp. 245-249). However, this was not to be. Whereas Salisbury, Adler, and Smalley, in their examination of excellent photographs taken through the 61-inch U.S. Naval Observatory reflector, found what they considered to be over 100 certain DHCs and nearly 300 uncertain ones, we are bringing the ALPO's DHC Program to a close with only 83 confirmed DHCs.

Nine of the ten persons who contributed to the DHC Program took part in the fundamental task of discovering and describing DHCs. They submitted 378 reports, and 86% of those reports were made by just two persons -- Alain Porter and the Program's Director.

The only aspect of the DHC Program which received adequate coverage was the reporting of the dark halos' intensities for the purpose of determining whether dark halos darken or lighten significantly in any pattern coinciding with the changing position of the Sun in the lunar sky. In all, 1400 intensity estimates were made by the six persons who took part in this aspect of the Program. As reported at the ALPO Convention in Riverside in 1972, no general characteristic pattern of variability was found for the 20 DHCs thus far studied. Most of the DHCs maintained an apparently constant intensity throughout the lunar day, although 4 of the halos appeared to fade within 2 or 3 days of sunset, one appeared to darken at lunar noon, and another appeared to darken in the afternoon. Alain Porter in reporting albedo observations of 45 DHCs in 1975 (JALPO, Vol. 25, Nos. 5-6) wrote that "only seven of them appear to show any sort of variation; and not even all of these patterns can be accepted without question."

The final ALPO catalog of 83 certain DHCs confirms the distribution pattern reported by Salisbury, Adler, and Smalley; i.e., these features are concentrated on the maria, particularly along the edges of the maria. In fact, 65% of the DHCs in the ALPO catalog are on the maria; and 23% lie on the dark mare-like floors of some of the larger craters. The association of DHCs with the maria supports the contention that DHCs are volcanic in origin. As noted by Winifred Cameron in 1972 (JALPO, Vol. 23, Nos. 9-10, p. 168) and by Alain Porter in 1975 (JALPO, Vol. 25, Nos. 5-6, p. 122), DHCs are usually found along the edges of maria, where the presence of rills, escarps, and extrusions such as domes indicates zones of maximum stress.

Although usually located in the same part of the maria as are rills and domes, DHCs are not often found in close association with these two types of probably volcanic features. Only three DHCs (DHC+271+301, DHC+256+306, and DHC-156+353) are also the summit craters of lunar domes. Although all three of these dark-haloed summit craters have a rill in close proximity, only one-quarter of the DHCs cataloged lie within 15 kilometers of any rill large enough to be recorded on the U.S. Air Force's Lunar Atlas Charts or to be seen through Earth-based telescopes.

Dark-haloed craters are distributed in much the same pattern as are lunar transient phenomena (LTP), which are thought to be volcanic outgassings. In 1967, Winifred Cameron and Barbara Middlehurst independently showed that such transient events generally occur around the margins of the maria (JALPO, Vol. 23, Nos. 9-10, p. 168). Both DHCs and LTP are also found in craters with mare-type floors and in the vicinity of bright-rayed craters, such as Copernicus. Efforts to monitor some of the more prominent DHCs for the purpose of detecting LTP failed to amount to much. In five 1-hour sessions of monitoring a few DHCs with a 12½-inch reflector in 1971, I detected no LTP; nor did Marvin Huddleston in a 45-minute observing period with a 6-inch reflector in 1972.

Participants in the DHC Program were advised to look for any rays within or extending beyond the dark halos. Only two DHCs were reported to have dark rays radiating from them (DHC+486-248 and DHC-447+103). DHCs evidently are not related to the Moon's many conspicuous bright-rayed craters.

An examination of the catalog of DHCs will reveal the marked tendency of DHCs to appear in clusters. Only 32 of the 83 DHCs are singular. The majority are in pairs or clusters. There are 8 pairs, 3 groups of three, and one group each consisting of four, six, seven, and nine DHCs. As expected on the basis of the volcanic theory, more than one DHC is likely to have developed in an area of crustal weakness.

The shapes of the dark halos and the location of the craters within them also indicate that most dark halos are the products of ash falls rather than that of outpourings of lava. All but 17 of the 83 craters are situated at or very near the exact center of their dark halos. If dark halos resulted from lava flows rather than from ash or cinder falls, all dark halos lying on sloping ground would have craters located near their up-hill perimeter, not near the center of the halos. Moreover, on anything but a flat surface outpouring lava would flow through and fill depressions, resulting in the formation of dark patches of various, irregular shapes. The ALPO study has found, on the contrary, that the majority of dark halos are radially symmetrical with respect to a central crater. Fully 78% of the dark halos are circular, 12% are elliptical, and only 10% are irregular in outline. The generally symmetrical appearance of these halos, which have smooth surfaces and low albedos, indicates that most dark halos consist of volcanic ash spewn from a central vent.

During several passes over the Taurus-Littrow region, Apollo 15 astronaut Al Worden observed and photographed numerous symmetric dark halos, which he interpreted as cinder cones. The returned high-resolution photographs (approximately two meters) showed many low-rimmed craters surrounded by smooth dark halos. Thomas McGetchin and James Head, geologists at M.I.T. and Brown University respectively, compared Mt. Etna's Northeast Crater, a terrestrial cinder cone, with two of the more prominent DHCs in the Apollo 15 photographs of the Littrow area. Both of these Apollo 15 lunar craters were too small for ALPO observers to detect. One crater has a diameter of 100 meters, and its dark halo measures only 1½ kilometers across; the other crater is 300 meters in diameter, with a dark halo 3 kilometers across.

These two, and similar lunar craters, could eject volcanic ash over a greater radius than Earth's volcanos due to the lack of atmospheric resistance and the Moon's lesser gravity. Geologists McGetchin and Head, after a careful ballistic study based on the study of terrestrial cinder cones, concluded that "many lunar dark-haloed craters are the lunar counterparts of terrestrial cinder cones with the differences in morphology attributable to differences in environment." (Science, April 6, 1973, Vol. 180, p. 70.) The ALPO's DHC Program in its study of the distribution and dimensions of DHCs has reached the same conclusion.

A.L.P.O. Catalog of Dark-Haloed Craters

The first column in this listing gives the xi and eta co-ordinates of each DHC, followed by its longitude and latitude. Under the column headed "Location", the letter "M" indicates that the DHC is located in one of the maria, and a "C" means that the DHC lies within a dark-floored crater. In the same column, the letter "G" indicates that the DHC is a member of a local group of DHCs, whereas "P" designates that it is one of a pair. Under the columns giving the diameters of the craters and halos, in kilometers, an asterisk (*) designates those craters which are not located in the center of their halos. In the last column, the letters "C", "E" and "I" designate halos that have circular, elliptical, and irregular perimeters respectively. Longitude and xi are positive to the east, where east is the hemisphere of Mare Crisium; latitude and eta are positive to the north.

DHC	Longitude	Latitude	Location	Diameter of crater	Diameter of halo	Shape of halo
+838-355	+63°38'	-20°48'	-	8	15	C
+821-122	+55°15'	-06°47'	M	2	6 x 8	E
+790+251	+54°33'	+14°32'	M, P	25	37	C
+774+227	+52°40'	+13°10'	M, P	14*	27 x 32	E
+760+313	+53°24'	+18°15'	M, P	18*	32 x 60	I
+757+331	+53°30'	+19°22'	M, P	10	15 x 20	E
+690-029	+43°50'	-01°40'	M, P	1½*	14	C
+671-053	+ 2° 2'	-03°00'	M, P	4	11	C
+556-317	+32°10'	-18°32'	M	5	10	C
+514-045	+29°08'	-02°35'	M	6	14	C
+500-196	+30°42'	-11°18'	M	2	6	C
+490+717	+44°35'	+46°20'	C, P	5½ x 4	15	C
+490-239	+30°20'	-14°13'	M, G	1*	4	C
+486-248	+30°04'	-14°22'	M, G	5*	15	I
+484+034	+28°55'	+02°00'	M	5*	20	I
+481-237	+29°40'	-13°42'	M, G	2	8	C
+480+814			C, G	1	4	C
+476+735	+44°35'	+47°25'	C, P	1½ x 3	15	C
+476+815			C, G	1½ x 2½	5	C
+473+816			C, G	1½ x 3½	5	C

A.L.P.O. Catalog of Dark-Haloed Craters (cont.)

DHC	Longitude	Latitude	Location	Diameter of crater	Diameter of halo	Shape of halo
+473+670	+39°40'	+42°02'	-	4	12	C
+412+709	+35°45'	+45°07'	M, G	4*	10	E
+407+708	+35°10'	+45°05'	M, G	2*	10	E
+392+707	+33°40'	+45°02'	M, G	4	15	I
+353+017	+20°38'	+01°00'	M	3	10	C
+271+301	+16°37'	+17°38'	M, P	3*	5 x 8	E
+256+306	+15°50'	+17°50'	M, P	2*	7	C
+222+294	+13°21'	+17°02'	-	7	20	C
+172+229	+10°10'	+13°16'	M	2	7	C
+127+248	+07°32'	+14°22'	M, P	1½	6	C
+125+259	+07°27'	+15°02'	M, P	2	5	C
+107+500	+07°08'	+30°03'	M, G	2	5	C
+087+513	+05°50'	+30°53'	M, G	3	12	C
+081+517	+05°25'	+31°10'	M, G	3	8 x 12	E
+073+510	+04°49'	+30°42'	M, G	4	14	C
+066+553	+04°33'	+33°37'	M	5	11	C
+050+071	+02°54'	+04°08'	M, G	1	7	C
+041+069	+02°32'	+03°52'	M, G	½	3½	C
+037+073	+02°13'	+04°03'	M, G	½	4	C
+037+078	+02°04'	+04°28'	M, G	½	2	C
+034+082	+01°52'	+04°38'	M, G	1	3	C
+033+076	+01°52'	+04°20'	M, G	2	4	C
-013+565	-01°55'	+34°28'	M	3	12	C
-025-235	-02°41'	-13°18'	C, G	1	8	C
-027-223	-01°37'	-12°52'	C, G	3	10	C
-028-217	-01°42'	-13°14'	C, G	2	7	C
-032-248	-01°50'	-14°22'	C, G	3½	11	C
-033-216	-01°55'	-12°33'	C, G	2	7	C
-057-238	-03°21'	-12°47'	C, G	1	5	C
-069-235	-04°03'	-13°40'	C, G	2	8	C
-070-234	-04°07'	-13°38'	C, G	1	6	C
-071-237	-04°11'	-13°43'	C, G	2	8	C
-112-538	-07°32'	-32°38'	C	2*	6½ x 5½	C
-127+192	-08°05'	+11°09'	M	2	6	C
-137+314	-08°20'	+18°20'	M, G	7	16	C
-143+320	-08°40'	+18°42'	M, G	6	16	C
-150+335	-08°58'	+19°30'	M, G	1½	3	C
-156-353	-09°33'	-20°42'	M	4	15	C
-166+306	-10°05'	+17°55'	M, G	½	1½	C
-180+299	-10°52'	+17°30'	M, G	4	7	C
-180+308	-10°52'	+18°00'	M, G	4	8	C
-186+146	-10°50'	+08°22'	M	2½	7	C
-205+290	-12°25'	+16°58'	M, G	6	9	C
-231+142	-12°28'	+18°12'	M	2	6	C
-231+199	-12°38'	+11°33'	C, P	1½*	6	C
-237+199	-13°59'	+11°30'	C, P	2*	7 x 11	E
-261+421	-16°45'	+25°06'	M	2	4½	C
-264+311	-16°03'	+18°13'	M	1½	6	C
-265+140	-16°01'	+07°53'	M	1½	2 x 5	C
-293+219	-17°32'	+12°41'	-	1*	6	C
-312+120	-18°15'	+06°53'	-	4½	15	C
-348+218	-20°28'	+12°28'	-	2½	10	E
-348+233	-23°38'	+13°35'	-	4	15	C
-398+083	-23°38'	+01°45'	M	1	4½	C
-409+052	-24°33'	+02°59'	M	2*	10	E

A.L.P.O. Catalog of Dark-Haloed Craters (cont.)

DHC	Longitude	Latitude	Location	Diameter of crater	Diameter of halo	Shape of halo
-447+103	-26°41'	+04°55'	M	7	16	I
-457+078	-27°39'	+04°30'	M	2½	7	C
-466+124	-28°01'	+07°08'	M	1½*	9	C
-488-744	-46°48'	-48°02'	-	9	21	I
-500-726	-46°32'	-46°27'	-	3½*	7	C
-575-695	-53°05'	-44°00'	C, G	4	11	I
-578-696	-53°39'	-44°07'	C, G	4	11	I
-659-700	-66°00'	-44°00'	-	5	14	C

Dark-Haloed Craters near Rills
(within 15 kilometers)

+790+251	-033-216
+490+717	-057-238
+476+735	-156-353
+392+707	-180+299
+073+510	-180+308
-025-235	-205+290
-027-223	-264+311
-028-217	-265+140
-032-248	-293+219
+256+306	-312+120
+271+301	

The Separations of Groups of DHCs
(The number on the left margin is the number of members in the group.)

2 +774+227 and +790+251 are separated by 45 kms.
2 +760+313 and +757+331 are separated by 35 kms.
2 +690-029 and +671-053 are separated by 35 kms.
2 +490+717 and +476+735 (in Atlas) are separated by 30 kms.
3 +490-239, +486-248, and +481-237 are separated by 10 and 20 kms.
3 +480+814, +476+815, and +473+816 are separated by 7 and 7 kms.
3 +412+709, +407+708, and +392+707 are separated by 12 and 40 kms.
2 +127+248 and +125+259 are separated by 20 kms.
4 +107+500, +087+513, +081+517, and +073+510 are separated by 10, 15, and 25 kms.
6 +050+071, +041+069, +037+073, +037+078, +034+082, and +033+076 are separated by 7 to 15 kms.
7 -137+314, -143+320, -150+335, -166+306, -180+308, -205+290, and -180+299 are separated by 15 to 50 kms.
2 -231+199 and -237+199 are separated by 8 kms.
2 -575-695 and -578-696 are separated by 10 kms.
2 +256+306 and +271+301 are separated by 36 kms.
9 -025-235, -027-223, -028-217, -032-248, -033-216, -057-238, -069-235, -070-234, and -071-237 (in Alphonsus) are separated by 10 to 50 kms.

A.L.P.O. Observers in the Dark-Haloed Craters Program

Name	Telescope (s)	Station	Albedo Observations	General Observations
Kenneth Delano	12½" & 6" refls.	Fall River, Mass.	536	224
Frank Des Lauriers	6" refl.	Plaistow, N.H.	189	6
Bruce Frank	6" refl.	E. Pepperell, Mass.	86	0
Eddie Harris	4" refl.	Lake Charles, La.	0	4
Marvin Huddleston	6" refl.	Mesquite, Texas	0	10
William Keel	6" refl.	Nashville, Tenn.	0	2
Chet Patton	2½" refr.	Buchanan, Mich.	65	8

A.L.P.O. Observers in the Dark-Haloed Craters Program (cont.)

Name	Telescope (s)	Station	Albedo Observations	General Observations
Alain Porter	6" refl.	Narragansett, R.I.	498	100
Chris Vaucher	8" refl.	Portland, Oregon	18	15
John E. Ventre	8" refl.	Cincinnati, Ohio	0	9
		TOTALS:	1,392	378

THE TOTAL LUNAR ECLIPSE OF NOVEMBER 18-19, 1975

By: Walter H. Haas

The circumstances of this eclipse were as follows:

Event	Universal Time	Eastern Standard Time
Moon enters penumbra	November 18, $19^h\ 25^m.5$	November 18, 2:25.5 P.M.
Moon enters umbra	20 38.6	3:38.6
Total eclipse begins	22 02.6	5:02.6
Middle of eclipse	22 23.4	5:23.4
Total eclipse ends	22 44.1	5:44.1
Moon leaves umbra	November 19, 00 08.2	7:08.2
Moon leaves penumbra	01 21.1	8:21.1 P.M.

Magnitude of eclipse = 1.068.

It is evident that in the Eastern United States this eclipse occurred early in the night with the Moon low in the sky, while farther west conditions were still less favorable. In England, from which one report has arrived, the middle of the eclipse came about an hour and a half before local midnight; and the Moon was there much higher.

We have received reports from the observers listed below. If the list is in error, the fault is wholly the author's; and he apologizes to those whose contributions have been overlooked. In truth, there must have been far more than five observers in the whole A.L.P.O. even of an eclipse with such unfavorable circumstances; the writer would most cordially invite our readers to submit to him their observations of future lunar eclipses.

Observer	Station	Instruments	Notes
Laird Calia	Lancaster, PA	3-inch refr., 6-inch refl.	
Daniel Costanzo	Arlington, VA	7 x 50 binoculars, 12-cm. diameter convex mirror	
Jeff Florczak	Saginaw, MI	?	Photographs
Alan W. Heath	Long Eaton, Nottingham, England	8 x 30 binoculars, 12-inch refl.	Many clouds
Craig R. Patterson	Lancaster, PA	6-inch refl., 7 x 35 binoculars, 6 x 30 finder	

<u>The Brightness of the Eclipsed Moon</u>. A simple observation of value is to estimate the eclipse luminosity at mid-totality on the Danjon Scale, which ranges from 0 for a very dark eclipse to 4 for a very bright eclipse. The scale is described with helpful details in <u>J ALPO</u>, Vol. 25, Nos. 5-6, pg. 85, 1975, for example. Costanzo estimated the luminosity of the November 18-19, 1975 eclipse to be 2 on the Danjon Scale; and Patterson estimated 1.5 - "this eclipse best fits the description of L = 2, but was slightly darker". Calia estimated 2 "under good conditions". For these three observers totality ended in bright evening twilight. Heath, however, in England had a few good views early in totality and estimated L = 3 on the Danjon Scale; he further comments: "This was one of the brightest lunar eclipses I have seen and certainly the most colorful."

Mr. Costanzo made a series of estimates of the stellar magnitude of the eclipsed Moon, applying corrections for differential atmospheric extinction. Jupiter was the comparison object for most of his estimates, though Deneb and Vega were used soon after the end of totality. He employed the familiar reversed binoculars technique for five estimates from $22^h\ 53^m$ to $23^h\ 22^m$, U.T. and the less popular convex reflector method for six estimates from $0^h\ 13^m$ to $4^h\ 22^m$, U.T. The value of the constant K for the 12-cm. diameter convex mirror which he employed was determined to be 2.07 stellar magnitudes. These methods and the evaluation of differential atmospheric extinction

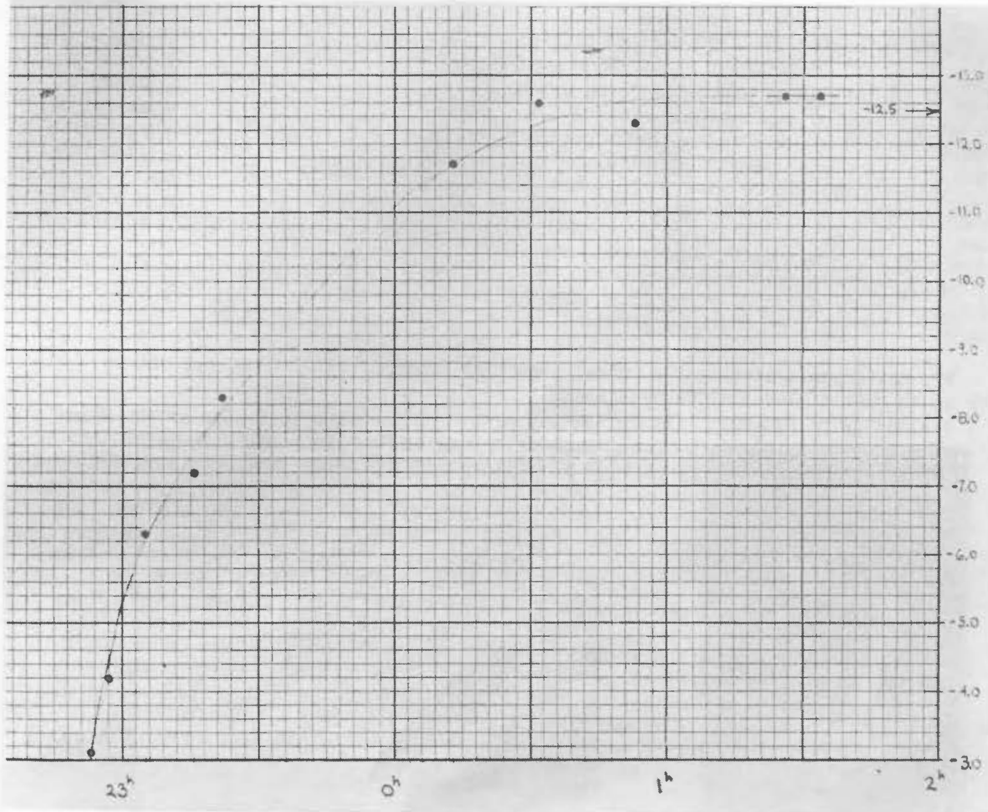

Figure 37. Observations by Daniel Costanzo during the lunar eclipse of November 18-19, 1975 of the stellar magnitude of the Moon (scale on right margin). Universal Time on bottom scale. The black dots are the observed data points, to which Mr. Costanzo has fitted a curve. Totality ended at $22^h\ 44^m$, and the Moon left the umbra at $0^h\ 8^m$. After the eclipse the stellar magnitude became constant at about -12.7. See also text.

* * * * * * * * * * *

corrections are covered by Dr. John Westfall in J ALPO, Vol. 25, Nos. 5-6, pp. 85-88, 1975. Costanzo's results are presented graphically in Figure 37.

Patterson alone comments on telescopic detail within the umbra. At $22^h\ 48^m$, U.T. he noted: "Only the outlines of the maria were discernible in the 6-inch in the central umbra. The only craters seen in the same area were Aristarchus, Manilius, and Menelaus (brightness in that order)." It was then 4 minutes past the end of totality, twilight was still bright, and a slight haze was present. At $22^h\ 51^m$ Patterson easily remarked Tycho and its ray system in the outer central umbra.

Colors on Eclipsed Moon. Several observers agree that the central part of the umbra was a dull copper red hue. Farther from the center the umbra became a brown-gray. Its outer edge was a dull yellow to Patterson just before the end of totality; and Heath in a good view at $21^h\ 56^m$, U.T., found silver-colored north and south limbs, like extended cusps of the bright white, still illuminated east limb. Patterson called the penumbral shading adjacent to the umbra light brown.

Contact Timings. Patterson observed Third Contact at 22 hrs., 44.08 mins. and Fourth Contact at 0 hrs., 08.35 mins. He used a chronometer checked with WWV both before and after the observations.

Crater Umbral Contact Times. Patterson and Calia observed when selected features were emerging from the umbra. They have reported their results to Sky and Telescope, which has reduced eclipse observations of this kind for many years. Perhaps, however, it will be of interest to compare the two observers on objects which they both timed.

Object	Patterson (U.T.)	Calia (U.T.)	Difference (P-C) (mins.)
Tycho	23^h $5^m.6$	23^h $4^m.3$	1.3
Kepler	19.7	19.7	0.0
Copernicus	25.7	22.9	2.8
Pytheas	32.5	32.5	0.0
Pico	45.0	45.0	0.0
Plato	45.7	45.0	0.7
Piton	47.4	45.4	2.0
Taruntius	51.8	51.8	0.0
Posidonius	52.4	52.6	-0.2
Endymion	0 02.8	0 03.3	-0.5
Picard	03.2	02.9	0.3

Mr. Patterson describes the umbral border as "moderately diffuse, but not so much as to make crater timings inaccurate".

Visibility of Penumbra. At 20^h 32^m, 7 minutes before the west edge of the Moon touched the umbra, Mr. Heath noted the west limb to be darker than the east limb. (West is the hemisphere of Mare Humorum.) Dimming over Oceanus Procellarum was very obvious in 8 x 30 binoculars but more so to the naked eye.

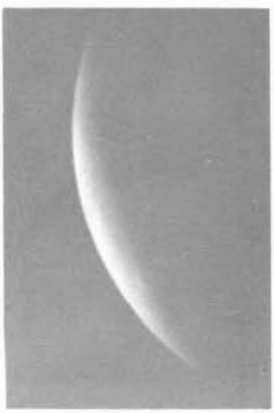

Figure 38. Photograph of eclipsed Moon by Alan W. Heath at 21^h 56^m, U.T. on November 18, 1975. 12-inch reflector at primary focus. Tri-X film. Exposure 1/10 second.

Anomalous Aspect of Umbra. Calia and Patterson at 23^h 21^m recorded a curious appearance, which the latter described as follows: "A slight irregularity was noted on the umbra border at a point just north of Kepler. At this point the border bulged outward slightly and then appeared to maintain a straight line to the northwest limb. However, the irregularity was not noted later; and I think that it was a contrast effect caused by the bright area around Kepler and the dark floor of the mare adjoining it."

The writer does not fancy that this description of so few eclipse observations can possess much scientific content. He will be very pleased if it encourages some readers to undertake systematic studies of future lunar eclipses. Certain eclipse observations can be of value when made carefully enough in great enough numbers and can also be a source of pleasure to the telescopic (or binoculars, or even naked eye) observer. Please submit future eclipse reports to Walter H. Haas, Box 3AZ, University Park, New Mexico 88001.

CASSINI A AND THE "WASHBOWL"

By: Walter H. Haas

Rodger Gordon of Nazareth, PA examined Cassini A, the largest crater on the floor of the lunar ring Cassini, on June 8, 1976 between 1^h 0^m and 2^h 15^m, U.T. In the course of testing a new eyepiece on a 3.5-inch Questar, eventually used at powers of 130X and 250X with a Barlow he glimpsed and finally clearly viewed "an obvious saucer-like depression on the floor of Cassini A". The Sun's colongitude was then 35°.8-36°.4. The seeing was 7-8 on a scale of 0 to 10, with 10 best; and the transparency was 2 (thick haze). These conditions are ideal for steady lunar viewing in Pennsylvania. Mr. Gordon telephoned Mr. William McHugh, a lunar observer since 1936 and one of the few observers of the July 4, 1974 solar white light flare. McHugh observed with a 6-inch reflector at 250X from Easton, PA, though with seeing not quite so good as Gordon's. He confirmed the presence of a "shallow depression" within Cassini A unlike anything he had ever seen there before.

The feature reminded Rodger Gordon of H.P. Wilkins' controversial "Washbowl" in Cassini A - see page 228 of The Moon by Wilkins and Moore. He writes that he has examined the ACIC Lunar Charts, Kopal's Atlas, Alter's Lunar Atlas, and the Orthographic Lunar Atlas without finding any shallow or saucerlike depression in Cassini A. McHugh has examined the Lunar Orbiter Atlas with the same negative results. The two observers make their depression no more than 1/3 the size of Wilkins' "Washbowl".

There is no intent here even to suggest any physical change in Cassini A; rather, the two observers think that illumination and libration enabled them to perceive a feature perhaps visible only under rather exacting conditions. Readers interested in lunar matters might like to do one or both of the following things:

1. Examine additional lunar photographs and atlases showing Cassini A under suitable solar illumination. Readers here might profitably make use of the ALPO Lunar Photograph Library, handled by Lunar Recorder John Westfall.

2. Observe the floor of Cassini A when the colongitude matches that of the Gordon-McHugh observations described above. In the near future such opportunities will occur on October 3, 1976, $22^h 40^m$ to $23^h 50^m$, U.T. and on December 2, 1976, $1^h 50^m$ to $3^h 0^m$, U.T. Of course, observations before and after these brief intervals are also encouraged. Good viewing!

ANNOUNCEMENTS

Lunar Section Staff Changes. Mr. Christopher Vaucher is regretfully resigning his Lunar Recordership because of the pressure of college studies. We are sorry to lose his services and thank him for his support, loyalty, and enthusiasm in recent years. Mr. Vaucher is being replaced as head of the Selected Areas Program by Marvin W. Huddleston, 14322 Seminole, Mesquite, Texas 75149. Interested lunar observers are invited to write to Mr. Huddleston, who will describe his project and its techniques in our next issue.

New Address for Dennis Milon. Our Comets Recorder now has this address: Dennis Milon, 111 School St., Acton, Mass. 01720.

Bumper Stickers for Anti-Light Pollution. Amateur astronomers must be concerned about the increasing deterioration of our night skies caused by increasing artificial lighting. A 4" by 11" vinyl sticker protesting light pollution ("Night is a Right!") can be purchased from Todd Pahl, Treasurer, Orange County Astronomers, 2417 N. Redwood Drive, Anaheim, CA 92806. The price is 50¢ each, 3 stickers for $1, or 20 for $5, postpaid. A.L.P.O. member John Sanford made up the slogan and designed the sticker.

Misstatement in Book Reviews in Vol. 25, Nos. 11-12. On pg. 255 of the issue cited our reviewer of Black Holes, Gravitational Waves, and Cosmology, by Rees, Ruffini, and Wheeler stated that there is no index. Actually, there is in this book a 7-page index commencing on page 325. We apologize to the publishers, Gordon and Breach of New York, and the authors for this error and thank Mr. Bernard J. Yates, Production and Promotion Controller for Gordon and Breach, for calling the mistake to our attention.

1976 Supplement to Jupiter Handbook. Jupiter Recorder Paul K. Mackal is offering a Supplement, price $2.00, to his 1972 Handbook, price also $2.00. The articles and authors in the Supplement are as follows: (1) "Observing Jupiter with a 6-Inch Reflector", by Paul K. Mackal; (2) "High Resolution Planetary Photography and Negative Enhancement", by Gary C. Seaman; (3) "The Use of Color Photos as a Guide for Disc Drawings", by Joseph P. Vitous; (4) "The Analysis of Jovian Filter Intensity Data", by Paul K. Mackal; (5) "The Jupiter Sections in the 1970's", by Paul K. Mackal; (6) "How to Pick Up and Draw Fine Details of Jupiter's Markings", by Toshihiko Osawa; (7) "Belt Disturbances and the Nature of Jovian Markings", by Wynn K. Wacker; (8) "The Distribution of Dark Material in South Equatorial Belt Disturbances", by Wynn K. Wacker; (9) "An Update on S.E.B. Disturbance Analysis", by Ron Doel; (10) "Tables to Assist Computation of Jovian Shadow Transit Times", by Walter H. Haas; (11) "Trend and Correlational Analysis of Jovian Ranks", by Paul K. Mackal.

Surely there is much for any earnest amateur Jupiter observer in the Supplement which Mr. Mackal is offering.

Award Given to Tsuneo Saheki. Mr. Takeshi Sato has informed us of an honor bestowed upon Mr. Tsuneo Saheki, who was for many years a major contributor to the ALPO Mars Section. The Astronomical Society of Japan at its convention in Tokyo on May 20, 1976 bestowed upon him its Shigeru Kanda Memorial Award in recognition of his observations and research upon Mars and of his contributions to astronomical education. The award was established by the family of the late Professor Kanda and was this year given to 9 amateur astronomers for the first time. Those besides Tsuneo Saheki have worked in such fields as comet discovery, variable star observation and research, celestial mechanics, meteor observation and research, and pioneer work in astrophotography. One of them, Tsutomu Seki, will certainly be known to ALPO Comets Section members.

Error in Vol. 25, Nos. 11-12 of This Journal. On page 245 of the issue cited photographs of Saturn during the 1966-67 edgewise apparition with the 61-inch Catalina reflector are attributed to Daniel Harris. Dr. Harris kindly points out that actually these photographs were taken by Alika K. Herring, while Harris recorded the data on the log. He also stresses in the same letter that in good views with the 61-inch he and three other observers saw no festoons, spots, or other detail on the globe of Saturn during the 1966-67 apparition, nothing but belts and zones.

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STAFF