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Two of the three co-discoverers of Comet Kobayashi-Berger-Milon 1975h. Left: Douglas Berger of Union City, Calif., with his 8-inch Newtonian, a homemade design with an open tube and a mounting of pipe fittings. Right: A.L.P.O. Comets Recorder Dennis Milon of Cambridge, Mass., with the 4-inch Fecker Newtonian he used. Both observers found the comet while aiming at the globular cluster Messier 2 in Aquarius. Photos by Dennis Milon. See text and illustrations on page 200 *et seq.*

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MORE ON LARGE-SCALE DISTURBANCES ON JUPITER

By: Wynn K. Wacker, A.L.P.O. Jupiter Section

I had intended to make a few minor additions and corrections to my paper, Large-Scale Disturbances on Jupiter, prior to publication. It appeared in J.A.L.P.O., Vol. 25, Nos. 7-8, pp. 145-150, June, 1975. Unfortunately, the paper had already been typed for publication when these changes reached Mr. Haas. I would like to take this opportunity to describe the more important additions.

First of all, there is additional evidence now available that a zenological disturbance started in December of 1970. The 1972 apparition report by Paul Mackal (J.A.L.P.O., 25(5-6):104-116, 1975) describes activity in the SEB_n-EZ-NEB region similar to that observed there during other zenological disturbances. I should mention that the original version of this paper was written before 1970 so that this disturbance is, in a sense, the first confirmation of the pattern of activity I described.

Secondly, I have been somewhat critical, or at least skeptical, of the Reese Uniformly Rotating Source Hypothesis in both this paper and a previous one. At the time I wrote these papers the evidence in favor of this hypothesis was, to my mind, far from overwhelming. Since then, however, the 1971 double SEB Disturbance has strengthened the case in favor of Reese's theory. My objection is not so much to uniformly rotating sources *per se*, but rather to limiting this mechanism to just one belt, the SEB. There is a fair amount of evidence that other belts "revive" in a manner similar to the SEB. They also should have their sources of dark material. Do those sources rotate uniformly? I would fully agree that the influences of the Red Spot and South Tropical Disturbances put the SEB in a unique position with respect to the other Jovian belts, but the same sort of analysis which has been applied to the SEB must be applied to the other belts in order to put this information in a meaningful comparative context.

Finally, I had rewritten the introductory paragraph of the paper. As it now stands, the introduction attempts to provide a physical justification for looking for large-scale Jovian disturbances. There is, however, a far more important reason for instituting such a search. Those of us interested in the visual aspects of Jupiter have our considerations strongly influenced by the way in which the data are collected and presented. In time, the data are sliced up into pieces each consisting of one apparition. In space, the reports divide the planet into specific belts and zones or, when events warrant it, into a group of adjacent belts and zones. When, occasionally, data from a series of observations over many apparitions are presented, they invariably still deal with a very small part of the surface of the planet. On the other hand, we would expect that large-scale patterns of activity extending over many belts and zones would occur over a number of years, purely from the physical considerations involved in such a titanic scale of change. We have been looking at Jupiter through small windows in space and time, and it should not be surprising if activity on this scale has escaped our notice. This paper was an attempt to break outside that framework to obtain a more holistic view of Jovian activity. If it has no other merit than to encourage others to make the same attempt, I will not regret the exercise.

THE APPEARANCE OF JUPITER IN 1973 -- AN INTERIM REPORT

By: Paul K. Mackal, A.L.P.O. Jupiter Recorder

This apparition was a mere continuation of the appearance of Jupiter late in 1972. A very active NEB-EZ persisted throughout 1973. The SEB_n was also dark and active on a smaller scale, by comparison to the NEB in 1973 and by comparison to the SEB_n in 1972. Most of my remarks will be directed to these events and to their probable meteorological significance.

Observers and researchers who participated in the writing of the present report included:

Phillip Budine of Unadilla, NY
Charles Capen of Flagstaff, AZ
Clark Chapman of Buffalo, NY
Ronald Doel of Evanston, IL
Walter Haas of Las Cruces, NM
Takao Hasebe of Nagoya-shi, Japan
Alan Heath of Nottingham, UK
Paul Mackal of Mequon, WI
Ernst Mayer of Barberton, OH
Michael Morrow of Ewa Beach, HI

Toshihiko Osawa of Hyogoken, Japan
Elmer Reese of Las Cruces, NM
Clay Sherrod of N. Little Rock, AR
J. Russell Smith of Waco, TX
Imre Toth of Baja, Hungary
Sandor Toth of Baja, Hungary
Nelson Travnik of Minas, Brazil
Antal Ujvarosy of Szolnok, Hungary
Joseph Vitous of Gays Mills, WI
Wayne Wooten of De Funiak Springs, FL

Observations were selected to reduce error in the sample by 10%, using the following formulae:

a^2 = the number of good full disc drawings of all observers considered to be excellent in ability divided by all of the discs they submitted.

b^2 = the number of bad discs of all observers considered to be fair in ability divided by all of the discs they submitted.

F = the number of fair observers.

G = the number of excellent observers.

σ^2_F = variance of F, b^2F^2. σ^2_G = variance of G, a^2G^2.

$\sigma^2_N = a^2G^2 + b^2F^2$.

$E(\sigma^2_F)$ = expected value of b^2F^2, $F^2E(b^2) = F^2b^2/F = Fb^2$.

$E(\sigma^2_G)$ = expected value of a^2G^2, $G^2E(a^2) = G^2a^2/G = Ga^2$.

Hence:

$E(\sigma^2_N) = E(\sigma^2_F) + E(\sigma^2_G) = Fb^2 + Ga^2$.

$err(\sigma^2_F)$ = error of variance, $f(n) = d\sigma^2_F(n)/dn$.

For an adequate sample: $\sigma^2_N = E(\sigma^2_N) + err(\sigma^2_F)$, $a^2G^2 + b^2F^2 = Ga^2 + Fb^2 + f(n)$.

Solving for f(n), or the main component of the error variance: $f(n) = a^2G(G-1) + b^2F(F-1)$.

Our test statistic for 10% reduction of error becomes: $[Ga^2 + f(n)]^{1/2}/[Ga^2 + Fb^2 + f(n)]^{1/2}$.

In the event that this statistic is able to reduce error by 10% or more, we are justified in dropping group F from further analysis. This was done in the present report.

Beginning on April 14, 1973, the NEB was already vigorous and the STB strong at 304°II or 29°I, according to T. Hasebe. Two large festoons appeared to be located at 11°I on May 2, according to N. Travnik. Figs. 1 and 2 by T. Osawa record large festoons crossing the EZ and strong dark festoon bases in a rejuvenated NEB_S from 220°I to 250°I. (The NEB_S was very active in 1972.) This took place from May 5 to May 23.*

During June and July the Recorder noted a high incidence of festoons, bases, roofs, cycles (which sometimes entailed two festoons for each cycle), humps, columns, flares, knots, spots, and undulations in the NEB_S, including a great festoon ($6^{\circ}.1$ wide) at 233°I on July 6, which was confirmed by Ron Doel on Fig. 6. This great festoon was the most spectacular feature I have ever seen in the EZ in my many years of experience. However, it was only one of eight or so odd festoons noted by me, and these encircled the EZ. The great festoon appeared to me to be the very origin of the EB in 1973! Festoon #1 was at 286°I; festoon #2 was at 319°I; and festoon #3 was at 347°I, all as on June 18. On July 14 the last two of these three were confirmed by Hasebe. A festoon was seen at 54°I on June 23. Festoon #4 was at 114°I on July 3, and a festoon #5 was at 133°I on July 5. Festoon #6 was at 180°I on July 6, and festoon #8 was located at 269°I. The great festoon was #7. Two other festoons were suspected in this time interval. Refer to Figs. 5, 9, 11, and 12.**

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*Note. On June 2 the NTB was weak at 66°II, according to Hasebe, and became fragmented towards the end of the apparition.

**Note. Capen's white EZ spot was seen by Travnik on June 26. Refer to Fig. 5.

Selected A.L.P.O. Drawings of Jupiter during its 1973 Apparition. S is the seeing on a scale of 0 (worst) to 10 (perfect).

Fig. 1: Toshihiko Osawa. May 5, 1973; 18:55 UT; 250°I, 358°II. 8-inch reflector. S4.

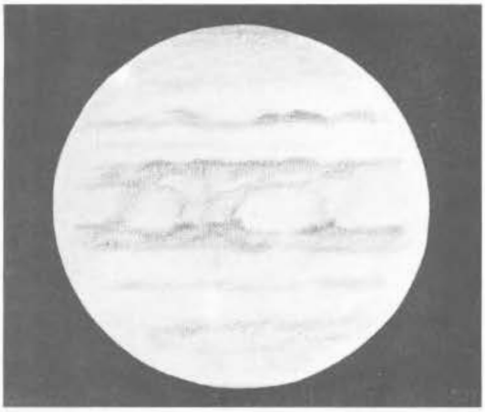

Fig. 2: Toshihiko Osawa. May 23, 1973; 19:07 UT; 220°I, 190°II. 8-inch reflector. S4.

Fig. 3: Ernst Mayer. June 10, 1973; 7:47 UT; 130°I, 326°II. 15.6-cm reflector. S8.

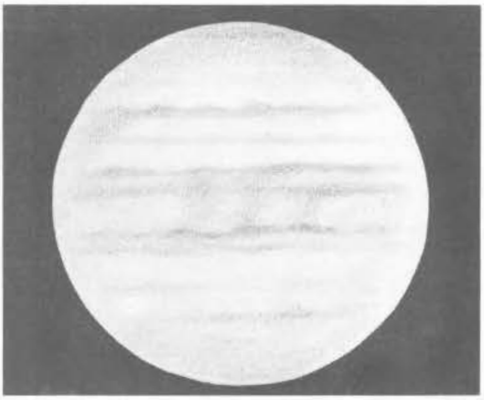

Fig. 4: Toshihiko Osawa. June 15, 1973; 19:25 UT; 265°I, 59°II.

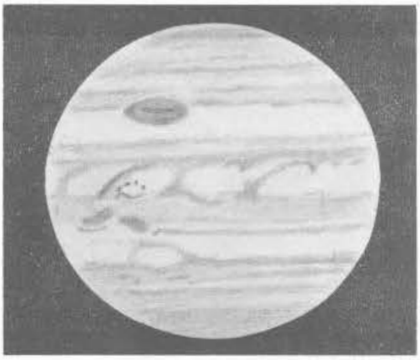

Fig. 5: Charles Capen. June 29, 1973; 9:00-10:15UT; 296°-342°I 347°-32°II. 12-inch reflector. S6.

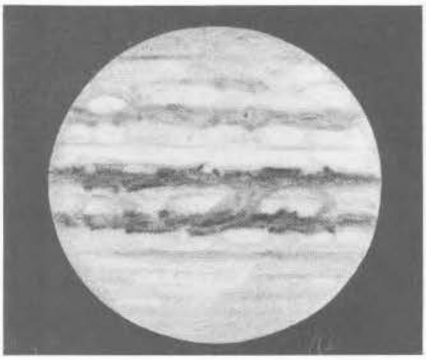

Fig. 6: Ronald Doel. July 6, 1973; 6:30-7:00 UT; 240°I, 238°II. 8-inch reflector. S7.5.

By late July and early August these spectacular events were capped by an even more impressive event, the complete reddening of the NEB_n. Earlier, Imre Toth (on July 14 and 21) had depicted a darkened NEB along with a dark SEB_n, from 92°II to 141°II, thereby confirming the Recorder's own observations. Prior to the reddening of the NEB_n, all of the EZ features were considerably reddish brown in color; yet columns remained grayish through August. Activity along the NEB_n did not abate, though it did not substantially

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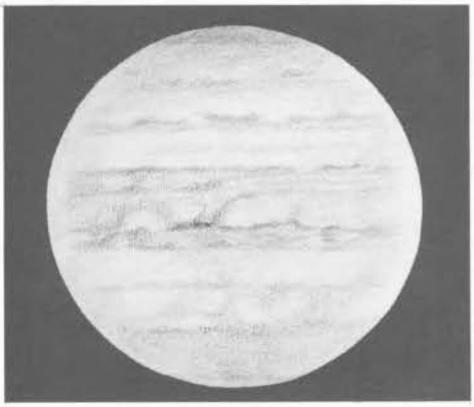

Fig. 7: Toshihiko Osawa. July 10. 1973; 17:15 UT; 176°I, 140°II. 8-inch reflector. S5.5.

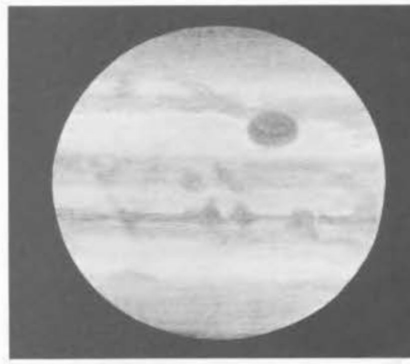

Fig. 8: Joseph Vitous. July 29, 1973; 3:47 UT; 166°I, 350°II. 8-inch reflector. S5.5. [Drawing from color photo.]

Fig. 9: Lawrence Carlino. July 30, 1973; 3:40 UT; 320°I, 136°II. 10-inch reflector. S4.5.

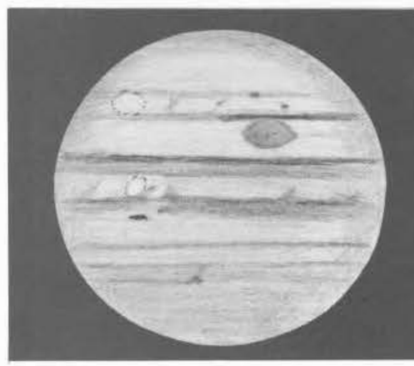

Fig. 10: Wynn Wacker. July 31, 1973; 5:20 UT; 179°I, 347°II. 15.6-inch refractor. S8.

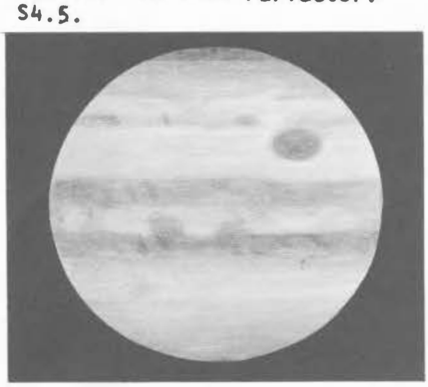

Fig. 11: Joseph Vitous. August 3, 1973; 2:44 UT; 198°I, 344°II. 8-inch reflector. S4.5.

Fig. 12: Lawrence Carlino. August 3, 1973; 3:23 UT; 222°I 7°II. 10-inch reflector. S6.

increase either. On August 11, 1973, Fig. 13 shows the NEB_n becoming very conspicuous and actually rivalling the NEB_s. The NEB_s activity remained constant, not levelling off as expected, so that the NEB erupted as a whole from this point in time to the conclusion of the apparition. Yet, each component did so independently of the other, or so it appeared! This condition of the NEB_n, first noted at 90°I, was confirmed in Figs. 14, 15, and 16 (at 15°I, 357°I, and 279°I); and Fig. 14 was confirmed by Fig. 17.

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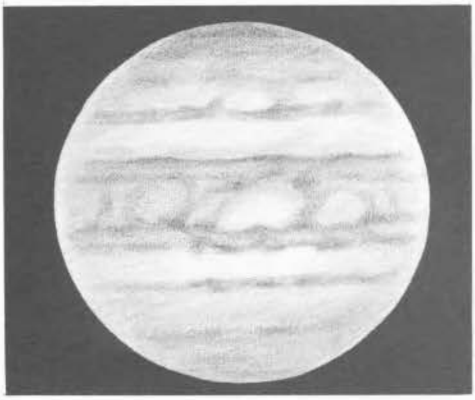

Fig. 13: Toshihiko Osawa. August 11, 1973; 14:27 UT; 90°I, 172°II. 8-inch reflector. S5.5.

Fig. 14: Joseph Vitous. August 27, 1973; 2:20 UT; 15°I, 338°II. 8-inch reflector. S3.5. [Drawing from color photo.

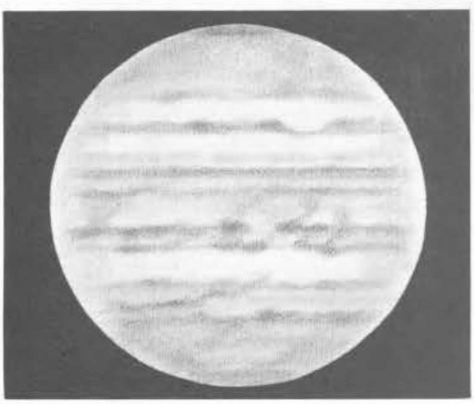

Fig. 15: Toshihiko Osawa. September 1, 1973; 9:58 UT; 4°I, 286°II. 8-inch reflector. S3.

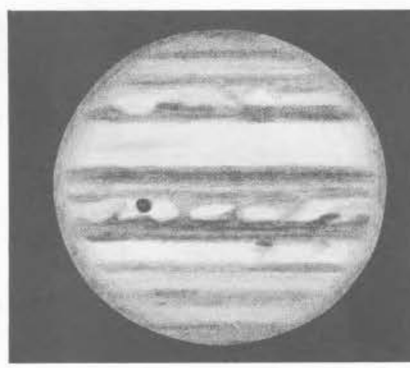

Fig. 16: Clark Chapman. September 2, 1973; 3:20 UT; 279°I, 196°II. 10-inch reflector. S4. Shadow of II left of C.M.

Fig. 17: Richard Wessling. September 4. 1973; 1:05-2:00 UT; 153°-186°I 55°-88°II. 12.5-inch reflector. S5.

Fig. 18: Joseph Vitous. September 4, 1973; 2:43 UT; 212°I, 114°II. 8-inch reflector. S4.5.

The NTrZ became faintly enhanced or reddish about two weeks after the reddening of the NEB_n, but this was only suspected by J. Russell Smith and J. Vitous. It was not confirmed by Elmer Reese on New Mexico State University Observatory plates, but the positive observations appear hard to refute with photographic evidence. (The Recorder ended his observations in August and cannot confirm or refute the observers. Elmer Reese appears to agree with Walter Haas and our Hungarian observers, however, in his assessment.)

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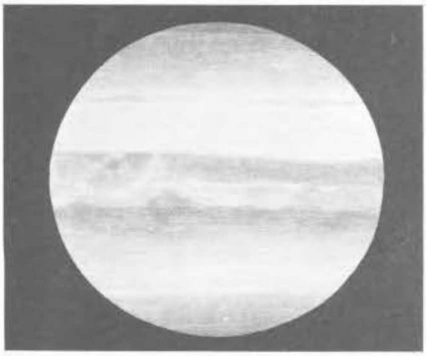

Fig. 19: Joseph Vitous. September 5, 1973; 2:03 UT; 346°I, 240°II. 8-inch reflector. S3.5.

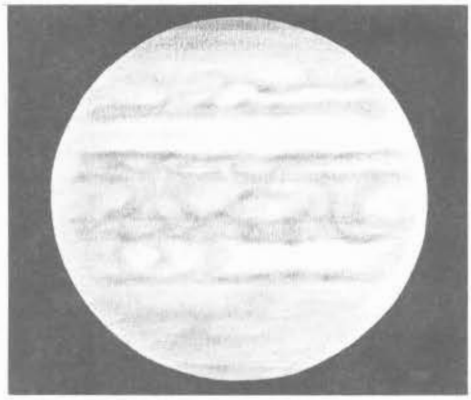

Fig. 20: Toshihiko Osawa. September 7, 1973; 12:50 UT; 336°I 212°II. 8-inch reflector. S4.

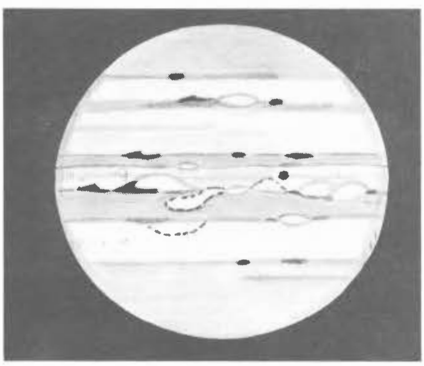

Fig. 21: Phillip Budine. September 10, 1973; 2:10 UT; 60°I, 276°II. 4-inch refractor. S8.

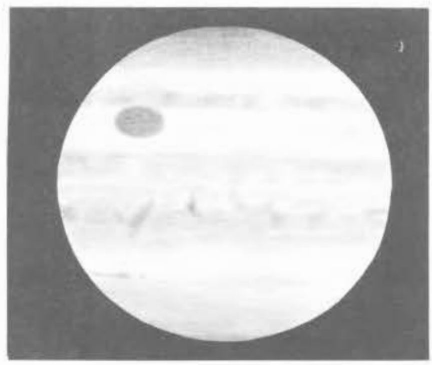

Fig. 22: Joseph Vitous. September 11, 1973; 1:22 UT; 188°I, 37°II. 8-inch reflector.

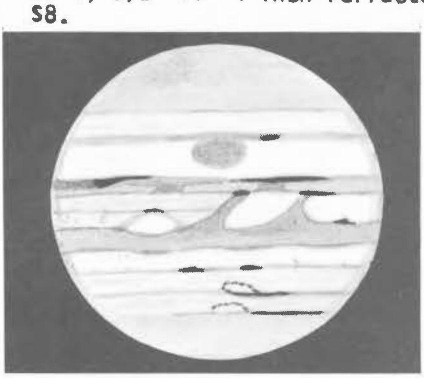

Fig. 23: Phillip Budine. September 13, 1973; 2:00 UT; 167°I, 1°II. 4-inch refractor. S8.

Fig. 24: Joseph Vitous. September 15, 1973; 3:51 UT; 191°I, 8°II. 8-inch reflector. S5.5.

Reference is here made to the 1973 color report on Jupiter, J.A.L.P.O., Vol. 24, pp. 213-217. The zone had been dull in June, cleared up in July, and became dull again in August (July 28), according to Alan Heath (149°II). He confirmed himself by observing the NTrZ dull again on August 12 at 227°II. Suffice it to say that very weak hues of red can be seen by red sensitive eyes which might be lost on photographic plates. Visual confirmation of all photographic colors is required to insure that such a supposition is valid, however. Heath observed a change in the NTrZ on the B.A.A. intensity scale, or on the A.L.P.O. intensity scale, of one and one-half steps, where one-half of

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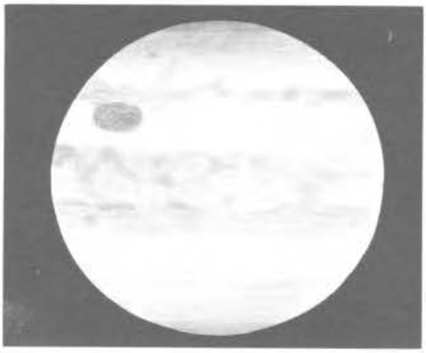

Fig. 25: Joseph Vitous. September 18, 1973; 2:14 UT; 245°I, 41°II. 8-inch reflector. S4.5.

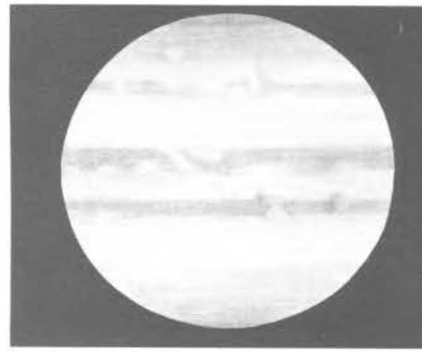

Fig. 26: Joseph Vitous. September 19, 1973; 2:08 UT; 39°I, 187°II. 8-inch reflector. S5.5.

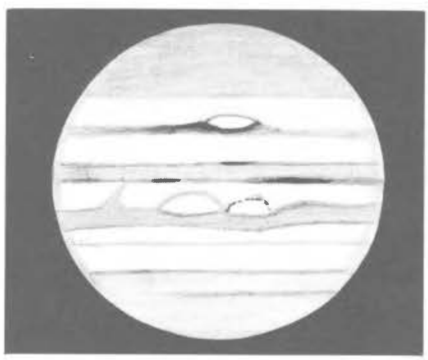

Fig. 27: Phillip Budine. September 21, 1973; 2:15 UT; 359°I, 132°II. 4-inch refractor. S8.

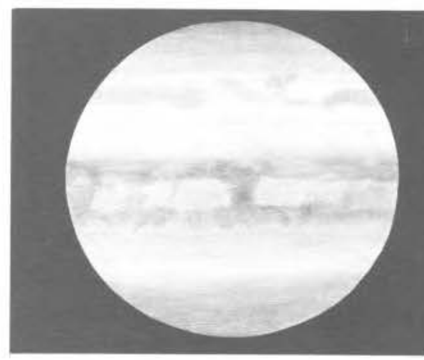

Fig. 28: Joseph Vitous. September 26, 1973; 1:10 UT; 29°I, 123°II. 8-inch reflector. S4.5.

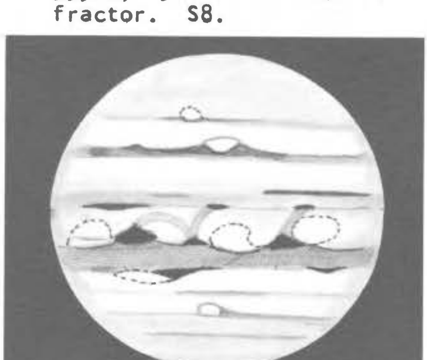

Fig. 29: Phillip Budine. September 27, 1973; 1:10 UT; 187°I, 274°II. 4-inch refractor. S8.

Fig. 30: Richard Wessling. October 3, 1973: 0:15-0:40 UT; 28°I, 69°II. 12.5-inch reflector. S5.

a step is deemed to be significant. These considerations go a long way in explaining the incongruity of so many observations of color or lack of color in the NTrZ.

On August 1, 1973, N. Travnik positioned four bright ovals along the NEB_s and a dark bar in the NEB_n at 316°II or 154°I. The NEB remained dark up to August 22 at 324°II, according to T. Hasebe. However, after late August Budine suggests on Figs. 21, 23, 27, and 29 a fading of the NEB and a return to a single aspect, the final phase of an NEB eruption. This development was not entirely confirmed by A. Heath, however, who insisted that the NEB intensity remained constant after August 1. On

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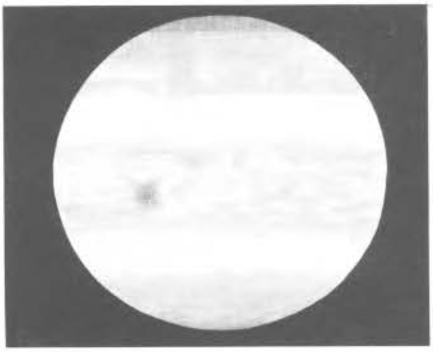


Fig. 31: Joseph Vitous. October 15, 1973; 1:12 UT; 148°I, 98°II. 8-inch reflector. S4.

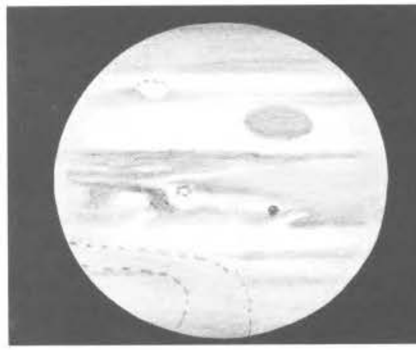


Fig. 32: Richard Wessling. October 22, 1973: 0:15 UT; 138°I, 34°II. 12.5-inch reflector. S7.

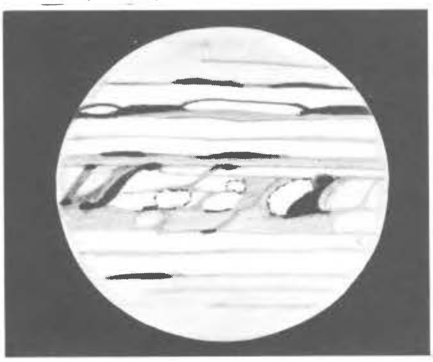


Fig. 33: Phillip Budine. October 22, 1973; 23:45 UT; 277°I, 166°II. 4-inch refrac. S8.

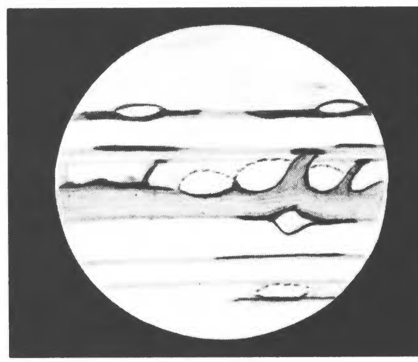


Fig. 34: Phillip Budine. October 24, 1973; 23:10 UT; 211°I, 85°II. 4-inch refractor. S7.

Fig. 35: Toshihiko Osawa. November 3, 1973; 8:45 UT; 182°I, 344°II. 8-inch reflector. S5.

Fig. 36: Richard Wessling. November 3, 1973; 23:55 UT; 16°I, 174°II. S4.

September 7 festoon activity in the NTrZ was noted by Osawa. See Fig. 20 (61°II). By mid-September the NTB was already beginning to fragment. By September 21 the NTB was much reduced. The NTrZ activity had ceased by the same time. See Fig. 24.

By late September the NEB was shown to be fading by observers other than Phil Budine. (See Figs. 28, 30, 31, 32, and 35.) EZ activity appeared to persist notwithstanding these changes in the darkness and activity of the NEB. In fact, dusky sections were seen from July to September by Mackal, Heath, Wessling, and others. This activity was strong even in late October, according to Phil Budine. See Figs. 33 and 34. Fig. 33 demonstrated the enlargement of the width of the great festoon on the following side of the CM.*

The STeZ oval DE was in conjunction with the RS during May and early June, according to N. Travnik. The preceding end of FA was at 117^{o}II on July 5, according to the Recorder, and was very bright and small in comparison to its previous appearance in 1972. Oval BC was at 186^{o}II on July 14, according to Dr. Travnik, and was also smallish in appearance. The RS was fading before August 1 but appeared to revive afterwards and had regained its prominence by November. See Fig. 37. The RS revived at the same time that the NEB_n became red, by the way. This appears to have been a mere coincidence.

The RS has been in a very dark phase since 1960 and has retained its prominent appearance for a long duration, indeed. This event has been recorded once before. Quoting Elmer Reese:

> The RS became prominent in 1878, and attained maximum darkness and redness in 1879, 1880, 1881, and early 1882. The spot nearly faded away in 1883 and 1884, and had a bright interior with a dusky edge in 1885. The RS was fairly dark again from 1887 through 1891, but not nearly as dark as it was from 1879 to 1887. (March 11, 1974--letter no. 728.)

Comparing 1885 with 1973, we see that the period 1960-1973 is entirely similar to the period 1878-1885, even though the RS was much larger and more intense in the 19th century. Hence, about ninety years after the RS had become very, very noticeable, it has done so again; I cannot help but regard this fact as an indication of volcanic periodicity! The upcoming half period, 1974-1980, should be compared with the older half period, 1887-1891. (The peak year so far has been 1968.)

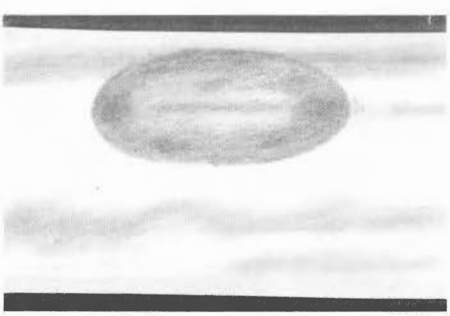
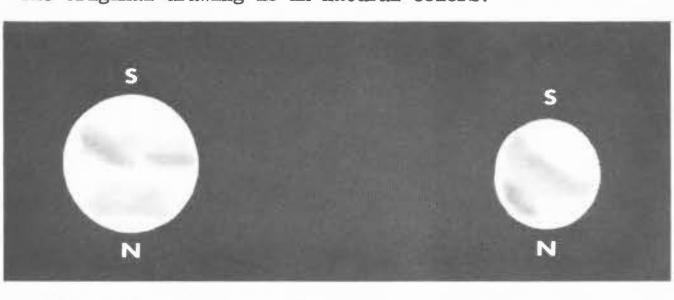


Figure 37. Drawing of Great Red Spot on Jupiter and Vicinity by Charles Capen on November 7, 1973, 1^h0^m-2^h20^m, U.T. Lowell Observatory 12-inch refractor, 200X and 385X. S 8. The original drawing is in natural colors.

Certain meteorological conclusions appear in order for the present interim report. Ralph Shapiro in his paper "The Distribution and Velocities of Bright and Dark Spots on Jupiter's Surface in 1928," contended that:**

> According to this hypothesis, a dark spot should represent a cyclone and a bright spot an anti-cyclone (i.e., regions of low and high pressure respectively). Jupiter's visible surface is a cloud surface which is undoubtedly at a high level in Jupiter's atmosphere. Consequently, by analogy with the earth's atmosphere, downward motion should exist near the visible surface of Jupiter over a cyclone, and upward motion over a Jovian anti-cyclone. (p. 6.)

The vortex motion of cyclones and anti-cyclones is liable to expand or contract the arbitrary circumference of same (thereby affecting the longevity of spots), notwithstanding the flow of colder gases into the high and of warmer gases out of same (and conversely for a low). We can deduce that



Figures 38 and 39. Drawings of satellites of Jupiter by C. F. Capen on June 22, 1973, 9^h0^m-10^h25^m, U.T. 24-inch Clark refractor, 830X. No filter and Wratten Filters 15 and 57. J. III (Ganymede) on left; J. I (Io) on right. Simply inverted views with south at top. J. I was 0.3 to 0.5 stellar magnitudes brighter than J. III.

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*It travelled in a special current discovered by Mackal and Reese in 1964 in the EZ, with a period of about 9 hrs., 50 mins., 57 secs.

**Lowell Observatory Bulletin; "Conference on Solar Variation and Planetary Atmospheres," chaired by G. Kuiper.

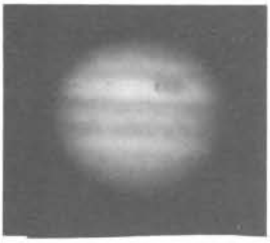

Figure 40. Photograph of Jupiter by J. Russell Smith on September 9, 1973, with the longitude of the Red Spot near the C.M. 16-inch reflector at f 110 on Tri-X. Enlarged on F5 Kodabromide.

the true white spots in the EZ which are larger than festoon bases by a factor of 10, very roughly, are to be regarded as compressed vortices less stable than dark spots, which are normal vortices which tend to expand and to become less intense and dark. All dark spots are low pressure regions; and all white ones are high pressure regions, by simple deduction. Just as we have discovered that festoon roofs frame the white zone underneath, we now believe that white spots ride high over dark spots. Hence, white spots should also ride very high over white zones underneath, as well as over belts, roofs, and dark spots!

Such considerations appear to have a greater likelihood of being confirmed than do mere statistical hypotheses of the sort which have engaged astronomers for these last two decades. A well founded meteorological thesis may be the key to many of the unresolved problems of the planet Jupiter, and such reports as these may be able to bring data to bear upon these issues.

A BLUE MISTY CLOUD OBSERVED IN ARISTARCHUS AND RELATED MATTERS

By: J. Russell Smith

Mr. Wade Cowan, an experienced amateur, of Dublin, Texas, observed a blue misty cloud in the crater Aristarchus on the night of September 7, 1974. Dr. Yosio Nakamura, Associate Professor of the University of Texas Marine Institute Geophysics Laboratory, Galveston, Texas, has examined the lunar seismic data tapes for the reported time period. However, he found no unusual events within several hours of the event. Dr. Nakamura relates that transient luminous phenomena, particularly in the southwest rim of Aristarchus, are now generally believed not to be caused by any activities of internal origin, such as volcanic activities, to which seismometers are sensitive. One theory is that at least some of the transient luminous events are caused by solar corpuscular radiation impinging on some localized luminescent materials on the lunar surface.

This event was reported to me by Mr. William C. Williams, Ft. Worth Astronomical Society, 5829 Wessex Avenue, Ft. Worth, Texas, 76133. Mr. Williams has requested that if anyone should have current information regarding the event, he should please relay his findings to him.

The following letter from Paul Gorenstein, Center for Astrophysics, Cambridge, Massachusetts to Mr. William C. Williams on January 28, 1975 may be pertinent to Mr. Cowan's blue misty cloud. It will certainly interest readers concerned with scientific research on Lunar Transient Phenomena.

"Regarding your letter of January 13th relevant to an optical event from the Crater Aristarchus, I am enclosing a reprint of a paper published in Science about two years ago. We observed the Crater Aristarchus for a period of several days during the time of the Apollo 15 mission, which took place at the end of July, 1971. Our instrument was sensitive to alpha particles produced from the decay of radon gas. Alpha particles are detected from lunar orbit in a solid state spectrometer. A signal was indeed observed from the Crater Aristarchus at a level of a few thousandths of an atom per centimeter square per second. Variable radon emission appears to be a feature of the lunar surface. Another report describes how we detected a radon daughter product, polonium-210, from the edges of Lunar Maria. The general conclusion we derive from the set of observations of Apollo 15 and Apollo 16 is that the emanation of radon gas is varying in both space and time on the lunar surface. The quantities of radon involved are exceedingly small and by themselves far below the levels needed to explain optical transient events. The mechanism by which radon is emitted is also unknown. One can hypothesize that radon is swept out by another gas that is emitted in much larger quantities. In fact, the other gas could have been emitted at a level of about 10,000 times larger quantities than the radon itself and would have been below the sensitivity of other Apollo instruments such as the mass spectrometer and ultraviolet spectrometer. The reason we detect radon so easily is that its radioactive decay emits a very specific signal for the Apollo Alpha Particle Spectrometer. In fact, about 40 atoms of gas at the detector is sufficient to give a definite indication of radon. We have no information on what might have occurred in September, 1974 since the Apollo instrument functioned only during Apollo 15 and Apollo 16 missions.

"If a gas release did occur on September 7, it may have been accompanied by trace amounts of radon according to the viewpoint we suggest in the second paper. The polonium-210 would be left as a residual of that event, and it could be detected by new observations with another Particle Spectrometer orbiting the Crater Aristarchus. We would very much like to have the opportunity to observe the Moon again to see what changes in the spatial distribution of polonium-210 have occurred since the Apollo mission. Changes in the polonium-210 distribution would reflect the transient activity that has occurred on the surface since the Apollo mission. In fact, we intend to propose an Alpha Particle Spectrometer for a lunar orbiter that NASA is considering to complete orbital lunar science programs begun during Apollo."

THE TOTAL LUNAR ECLIPSE OF NOVEMBER 29, 1974

By: Walter H. Haas

The circumstances of this eclipse were as follows:

Moon Enters Penumbra	Nov. 29,	$12^h25^m.9$, E.T.
Moon Enters Umbra		$13^h29^m.3$, E.T.
Total Eclipse Begins		$14^h35^m.8$, E.T.
Middle of Eclipse		$15^h14^m.1$, E.T.
Total Eclipse Ends		$15^h52^m.4$, E.T.
Moon Leaves Umbra		$16^h58^m.9$, E.T.
Moon Leaves Penumbra		$18^h02^m.1$, E.T.
Magnitude of Eclipse = 1.295		

The only observer from whom we have received a report is Lunar Recorder John E. Westfall. (If this statement is in error, the author accepts all blame.) Observing at his residence at San Francisco, California, Dr. Westfall was handicapped by the low altitude of the Moon, associated bad seeing (2 at the beginning of observations and 1 or worse at their end on the usual 0 to 10 scale), increasingly strong twilight after about 14:15, U.T., and poor transparency (3 to less than 1 as a limiting stellar magnitude). He used these instruments: a 10-inch Cassegrain reflector at 82X, a 4-inch refractor at 48X, a 4-inch f/10 refractor for photography only, 10 x 50 binoculars, and a 135-mm. f/1.8 telephoto lens.

First contact was observed at $13^h28^m.4$, U.T.; second contact was observed at $14^h35^m.4$, but is uncertain due to poor seeing. Timings were obtained with a pocket watch, which was checked against WWV both before and after the observations. It may be worth mentioning that Ephemeris Time (E.T.) was about 45 seconds later than Universal Time (U.T.) on the date of this eclipse.

Conditions did not allow any estimates of the luminosity of the eclipse on the Danjon Scale or of the integrated stellar magnitude of the Moon in eclipse.

Fifteen crater ingress timings were obtained and were promptly forwarded to Sky and Telescope.

Penumbral shading was visible to John Westfall on the southwest limb (IAU sense) at 13^h5^m, U.T. in binoculars and was definite to the naked eye by 13^h15^m. At 13^h32^m the interior of the umbra was visible in the 4-inch refractor; and its edge was bluish. Times of photographs taken were recorded. At 13^h35^m the same telescope showed a reddish tint in the umbra, whose interior was barely visible at 13^h48^m. At 14^h0^m binoculars showed the umbra interior to be reddish. The Moon was no longer visible in the 10-inch reflector at 14^h39^m and was invisible in binoculars two minutes later.

The reader may properly consider that the information content of this note is minimal, relating as it does a single observer's efforts under adverse conditions. Nevertheless, the author considers its publication worthwhile for the insight which it permits into how an experienced lunar observer planned and executed a program for that frequent and enjoyable phenomenon, a lunar eclipse.

THE 1973-74 APPARITION OF SATURN

By: Julius L. Benton, Jr., A.L.P.O. Saturn Recorder and
Clay Sherrod, A.L.P.O. Assistant Saturn Recorder

Introduction (Dr. Benton)

The report which is presented within these pages covers the observing period from 1973, July 15 to 1974, June 5, during which time the numerical value of B, the planetocentric latitude of the Earth referred to the ring plane, varied between $-26^o.879$ and $-25^o.870$. Southern portions of the globe of Saturn and the ring system were thus visible to observers. Opposition occurred on 1973, December 23; and the apparent visual magnitude of Saturn on that date was -0.3. The major axis of the ring system at the time of opposition measured 46".73, while the minor axis was then 20".74. On the same date, the equatorial and polar diameters were, respectively, 20".75 and 18".57.

The following individuals contributed observational reports of features on the globe to the Saturn Section during the 1973-74 apparition:

Observer	Station	No. of Dates of Observation	Basic Telescope(s)
Benton, Julius L.	Clinton, South Carolina	12	4"(10.2 cm.) Refr.
Capen, Charles F.	Flagstaff, Arizona	1	24"(61 cm.) Refr.
Doel, Ron	Evanston, Illinois	1	16"(40 cm.) Refl.
Haas, Walter H.	Las Cruces, New Mexico	8	12.5"(31 cm.) Refl.
Hanford, Jon	Reynoldsburg, Ohio	6	8"(20 cm.) Refl.
Heath, Alan W.	Nottingham, England	20	12"(30 cm.) Refl.
Hull, Richard L.	Richmond, Virginia	4	7"(18 cm.) Refr. 12"(30 cm.) Refl.
Iskum, József	Budapest, Hungary	1	8"(20 cm.) Refl.
Keszthelyi, Sándor	Budapest, Hungary	5	8"(20 cm.) Refr. 6"(15 cm.) Refl.
Kökény, Autal	Eger, Hungary	1	6"(15 cm.) Refl.
Mohácsi, Gyula	Székesfehérvar, Hungary	5	6"(15 cm.) Refl.
Mott, Jeff	Franklin Lakes, New Jersey	1	6"(15 cm.) Refl.
Ng, H.C.	Hong Kong	1	3"(7.5 cm.) Refr.
Owen, E. Ken	Oklahoma City, Oklahoma	3	10"(25 cm.) Refl.
Papp, János	Budapest, Hungary	19	6"(15 cm.) Refl.
Pastore, Peter J.	Massapequa, New York	11	10"(25 cm.) Refl.
Porter, Alain	Narragansett, Rhode Island	16	6"(15 cm.) Refl.
Sanderson, Rob	Little Silver, New Jersey	13	6"(15 cm.) Refl.
Schaefer, Brad	Littleton, Colorado	1	20"(51 cm.) Refl.
Sherrod, Clay	North Little Rock, Arkansas	2	5"(12.5 cm.) Refr. 10"(25 cm.) Refl.
Smith, J. Russell	Waco, Texas	7	16"(40 cm.) Refl.
Tóth, Imre	Eger, Hungary	33	6"(15 cm.) Refl.
Tóth, Sándor	Hajdunánás, Hungary	1	10"(25 cm.) Refl.
Ujvárosy, Autal	Nyiregyháza, Hungary	1	6"(15 cm.) Refl.
Wessling, Richard J.	Milford, Ohio	1	12.5"(31 cm.) Refl.
Zeh, Harold F.	Toledo, Ohio	1	8"(20 cm.) Refl.

A total of 175 observations of globe detail was received from the 26 individuals listed above, and the following distribution of submitted reports by months will serve to indicate those periods in which observational attention was greatest:

1973,	July	2	1974,	January	31
	August	7		February	32
	September	3		March	41
	October	12		April	14
	November	13		May	2
	December	17		June	1
		Total:	175		

The greatest mass of observational data was gathered during and around the time of opposition. There were nearly twice as many observational reports obtained during the months immediately following opposition as there were received prior to that date. The extreme early and late portions of the apparition were virtually neglected, and the Recorder must continue to urge observers to begin their programs soon after the planet emerges from conjunction with the Sun and to proceed until Saturn is again lost in the solar glare (at the subsequent time of conjunction). The 1973-74 apparition came to an end as Saturn reached conjunction with the Sun on 1974, June 30.

The writer extends his sincere gratitude to all individuals mentioned in this report for their continued interest and worthwhile participation in the observing programs of the Saturn Section. A special recognition is due to the handful of colleagues in Hungary who so faithfully submitted their observational data throughout the apparition. Such meaningful coöperation is most welcome, and we hope that our friends abroad will continue to take an active part in our work. Perhaps a few of our readers will begin corresponding with our international cohorts on a regular basis.

In the paragraphs which follow, general descriptive notes have been prepared from the mass of observational data received by the Section during 1973-74 with specific reference to clearly-defined global features. Mention of specific individual's names has been omitted in light of the generalization of related observational data; in the case of especially noteworthy or essentially isolated phenomena, the person(s) associated with the observation(s) is(are) identified. Individuals who might desire additional information regarding a particular feature should contact the writer for details and related data. Reference to accompanying photographs and drawings (Figures 41-46) will help clarify and illustrate as effectively as possible the points emphasized in the discussion below.

Southern Portions of the Globe. The southern hemisphere of the planet Saturn exhibited only a very moderate level of activity during the 1973-74 apparition; and aside from subtle brightenings of the EZ (Equatorial Zone), the STrZ (South Tropical Zone), and the EB (Equatorial Band), most of the belts and zones were slightly darker than in preceding observing seasons. Particular note should be made of the rather pronounced darkening of the SPR (South Polar Region) since the 1972-73 apparition. Worth mention also is the apparently stable intensity of the SEB Z (South Equatorial Belt Zone) since 1972-73.

A continuation of our comparative study of the average observed numerical relative intensities of selected global features is presented in the following table. The intensities are on a scale of 0 (shadows) to 10 (most brilliant features), with the outer one-third of Ring B arbitrarily given a value of 8.0.

Zones:	1972-73	1973-74	Comparison
EZ	6.5	6.8	Brighter (0.3)
STeZ	5.5	5.2	Darker (0.3)
STrZ	5.7	6.1	Brighter (0.4)
SEB Z	5.3	5.3	Unchanged (0.0)
SPR	4.1	2.9	Darker (1.2)
Belts:			
SPC	4.9	4.6	Darker (0.3)
EB	3.8	4.0	Brighter (0.2)
STeB	4.3	3.7	Darker (0.6)
SEB_s	3.8	3.3	Darker (0.5)
SEB_n	3.4	3.0	Darker (0.4)
SPB	3.7	3.4	Darker (0.3)

The table shown above is an extension of that table which accompanied the report for the 1972-73 apparition of Saturn (see Journal of the A.L.P.O., 25, (3-4), 1974).

South Polar Region (SPR). The rather diffuse SPR remained essentially stable with respect to numerical relative intensity throughout the 1973-74 period, although a marked darkening of the SPR was evident compared to 1972-73. A somewhat diffuse and poorly-defined SPB (South Polar Belt) was detected on a few occasions during the apparition; and in addition observers noted the SPC (South Polar Cap) intermittently, usually describing it as a rather diminutive, diffuse region, considerably lighter in overall intensity than its surroundings. It is quite likely that any possible enhancement in the prominence of the SPC may be due only to the darkening of the adjacent environs.

South South Temperate Zone (SSTeZ). Only a small number of individuals actually reported having observed this zone during the apparition. As shown by Table I, the average intensity of the SSTeZ was the same as that of the STeZ. No activity of any significance was reported in this region during 1973-74.

South South Temperate Belt (SSTeB). The very few descriptive reports which were obtained revealed that the SSTeB was a rather dusky, discontinuous, and roughly linear feature, having a greyish tone throughout. Intensity estimates (see Table I) show that the SSTeB was only just a shade lighter than the SEB_s when it was seen at all.

South Temperate Zone (STeZ). The STeZ was fairly prominent during most of 1973-74, appearing only slightly darker than it had been in 1972-73; and the numerical intensity of the STeZ did not vary to any significant degree. A small handful of individuals recorded ill-defined festoon activity and a few bright ovals in this zone at various times throughout the 1973-74 period, but such features tended to remain largely transient in nature. The STeZ was, on the whole, darker than the other zones in the southern hemisphere of Saturn, with the one exception of the SSTeZ.

TABLE I.

VISUAL NUMERICAL RELATIVE INTENSITY ESTIMATES OF MAIN SATURNIAN

FEATURES FOR THE 1973-74 APPARITION WITH ACCOMPANYING

ABSOLUTE COLOR ESTIMATES

Feature(s)	Relative Intensity: Number of Visual Estimates	Derived Average Intensity	Estimated Absolute Color
ZONES:			
EZ	45	6.76	yellowish-white to white
EZ_s	2	6.10	yellowish-white to white
STrZ	36	6.05	yellowish-grey to pale yellow
EZ_n	2	5.95	yellowish-white to white
SEB Z	25	5.34	tan to yellowish
STeZ	40	5.20	greyish-brown to yellowish-grey
SSTeZ	4	5.20	yellowish-white
Globe from SPB to SEB	6	5.20	yellowish
Globe from SEB to STeZ	2	5.00	yellowish
BELTS:			
SPC	10	4.55	brownish-grey
SEB	17	4.00	dark yellowish-grey to greyish brown
EB	11	3.99	greyish to brown
STeB	18	3.71	greyish to brown
SPB	8	3.43	bluish-grey
SSTeB	3	3.30	greyish
SEB_s	32	3.26	reddish to brownish-grey
SEB_n	33	2.97	reddish to brownish-grey
SPR	45	2.85	dark greyish to brownish-grey
RINGS:			
Ring B (Outer 1/3)	-- Standard	8.00	white
Terby White Spot	11	7.32	white
Ring B (Inner Portion)	21	7.09	yellowish-white
Ring A (General)	14	6.40	greyish-white to pale orange
Ring A (Inside A5)	12	6.30	yellowish-white
Ring A (Outside A5)	17	6.28	yellowish-white
B7 (near ansae)	6	2.67	very dark grey
B1 (near ansae)	3	2.67	very dark grey
B10 (front of globe)	1	2.50	very dark grey
B2 (near ansae)	3	2.45	very dark grey
A5 (near ansae)	6	2.30	very dark grey
B3 (near ansae)	5	2.24	very dark grey
Crape Band	14	1.60	very dark grey
B5 (near ansae)	3	1.27	very dark grey
Ring C (off globe)	9	0.91	very dark grey
Shadow of the Globe on the Rings	43	0.36	dark brown to black
B10 (near ansae)	17	0.27	very dark grey to black

Visual numerical relative intensity estimates are based upon the standard ALPO intensity scale, whereby 0.0 represents complete black (shadows) and 10.0 indicates the very brightest objects. The adopted scale uses as its standard of reference the brightness of the outer third of Ring B, having an assigned intensity of 8.0, which is considered fairly constant. A discussion of the intensity scale which is mentioned here can be found in the appropriate literature available from the author upon request.

* *

South Temperate Belt (STeB). The STeB displayed a much darker intensity, and observers tended to report it with greater frequency, during 1973-74 than in the preceding apparition. This belt resembled the SPB in apparent brightness, the STeB having only a slightly lighter appearance. Various drawings suggested that the activity in the adjoining STeZ on occasion became associated with the STeB, but the real nature

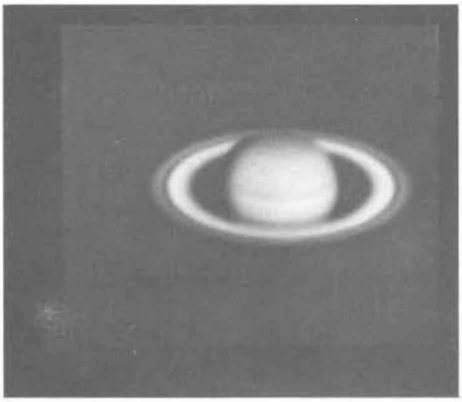

Figure 41. Charles F. Capen. October 11, 1973. 12^h23^m, U.T. Green light. Lowell Observatory Alvan Clark 24-inch refractor.

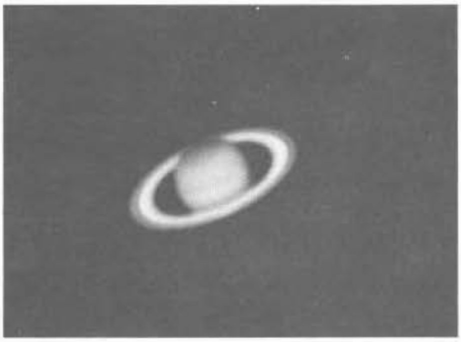

Figure 43. E. Ken Owen. December 22, 1972 (1973?). 6^h17^m, U.T. 10-inch F/6.15 Newtonian reflector. Tri-X film, ASA 400, exposure 3 seconds at F/185. Seeing about 6. Miranda G, 35mm. camera. Developer FG-7.

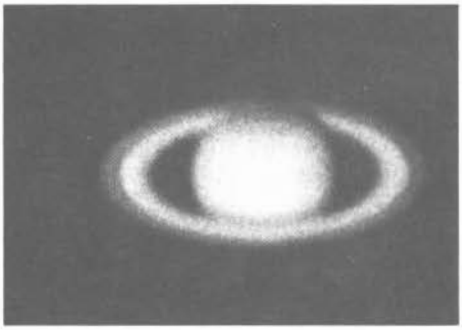

Figure 44. Richard Hull. January 31, 1974. 7-inch, F/15 refractor at F/105. Tri-X film. ASA 600. Exposure 4 seconds.

Figure 42. Richard J. Wessling. March 8, 1974. 2^h40^m, U.T. 12.5-inch Newtonian reflector. Tri-X film. Seeing 7 (fairly good), transparency 3 (rather poor).

* *

of the apparent connection remained undefined.

South Tropical Zone (STrZ). Other than the EZ, this zone was the brightest on the entire globe of Saturn during 1973-74. Reference to the data from our comparative study of the present and foregoing apparitions reveals that the STrZ has brightened to a small degree. Although the intensity of the STrZ remained essentially stable, some festoon activity was noticed in this zone during 1973-74. Small, vague whitish spots, mostly of uncertain dimensions and morphology, showed up from time to time as well.

South Equatorial Belt (SEB). When recorded as a whole, the SEB was a little lighter in intensity than it had been during the 1972-73 period; while as was the more usual case, when the SEB was clearly differentiated into northern and southern components, the SEB_n was always consistently darker than the SEB_s. The same relationship between the north and south components of the SEB was noticed in 1972-73, although both the SEB_n and SEB_s showed a darkening trend in this apparition. The SEB Z was always clearly seen separating the two SEB components, its brightness and overall appearance enhanced during 1973-74 most probably by the darkening of the SEB_s and SEB_n since the previous apparition. Reference to our comparative intensity data reveals that the estimated brightness of the SEB Z has remained consistent since 1972-73. Some diffuse structural discontinuities were reported in the SEB_s and SEB_n; however, nothing definite could be confirmed by observers. The SEB Z was very nearly equal in brightness to the STeZ and the SSTeZ. The SSTeB and SEB_s differed only very slightly in intensity, while the SEB_n and the SPR more closely corresponded in overall brightness.

Equatorial Zone (EZ). As has been the case in recent years, the EZ remained the brightest zone on Saturn's globe during 1973-74, having brightened by a small degree since 1972-73. The EZ_s was a little brighter than the EZ_n, and vague suspicions of bright ovals and festoons were reported by observers for the EZ as a whole. Only infrequently perceived, the elusive EB (Equatorial Band) was described as a very thin linear feature, often interrupted along its length. The EB was not quite so dark in 1973-74 as it had been in 1972-73.

Shadow of the Globe on the Rings. The shadow of the globe on the rings of Saturn was distinctly black on most occasions during 1973-74. Any deviation from the true black condition may fairly confidently be ascribed to an effect of imperfect seeing conditions and certain limiting factors of telescopic resolution.

Latitudes of Saturn's Belts and Zones. While a few individuals submitted a series of latitude estimates, those which proved to be useful in an analysis were indeed small in number. A high degree of inconsistency appears still to exist among the data, and this is most probably attributable to a lack of understanding among observers as to how effectively to employ the technique. To this end, the writer must urge individuals to work closely with him on the method, which in practice is quite easy to execute; proficiency is established in a short period of time with practice. For 1973-74, values assigned independently to belt edges by the author and Haas corresponded surprisingly well.

Mathematical reduction to latitudes appears in Table II. Caution must be exercised in any attempt to assume too much from such sparse data. The writer is hopeful for a more active participation among observers in the coming years so that the method can be critically evaluated and compared to other techniques. In this respect, measurements with a filar micrometer are desired from those who may have access to such a device. Those seeking information on the availability of filar micrometers might contact the author for a list of possible sources.

TABLE II.

LATITUDES OF SATURNIAN FEATURES DURING THE 1973-74 APPARITION

Feature	Saturnian Latitudes: Eccentric	Planetocentric	Planetographic
N edge Crape Band*	+22°563	+20°355	+24°954
S edge Crape Band*	+12.994	+11.651	+14.477
N edge SEB_n	-24.384	-22.036	-26.915
S edge SEB_n	-27.711	-24.490	-29.728
N edge SEB_s	-35.451	-32.445	-38.571
S edge SEB_s	-38°339	-35°227	-41°533
Center SEB_s	-35.347	-31.425	-38.460
N edge SPB	-75.931	-74.196	-77.276
Center EB	- 7.653	- 6.842	- 8.556

The Satellites of Saturn (Mr. Sherrod)

Observations received consisted of three sets of colorimetry estimates by Alan W. Heath with a 12-inch reflector at Nottingham, England and of one set of relative brightness estimates by Walter H. Haas at Las Cruces, New Mexico. It is impossible to base any useful analysis upon so little data. Observers are cordially invited to correspond with the author about amateur studies of the satellites and to undertake such observations.

A Summary of Ring Activity in 1973-74 (Mr. Sherrod)

Observations contributed were as follows:

Observer	Station	No. of Dates of Observation	Telescope
Evans, John	North Little Rock, Ark.	5	5" f/16 Refr.
Haas, Walter H.	Las Cruces, New Mexico	7	12.5" Refl.
Heath, Alan W.	Nottingham, England	19	12" Refl.
Sherrod, Clay	North Little Rock, Ark.	21	5" f/16 Refr.
Smith, J. Russell	Waco, Texas	8 & 2 photographs	16" Refl.

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*The latitude of this feature varied with the changing value of the tilt B. Hence, the averages given have limited meaning.

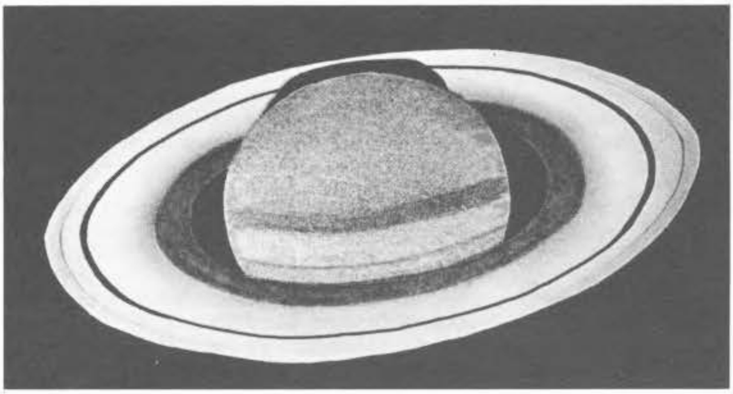

Figure 45. Drawing of Saturn by Alan W. Heath on December 23, 1973 at $22^{h}0^{m}$, U.T. 12-inch reflector, 318X. Seeing 3 (rather poor). The reader is invited to study this drawing carefully in connection with the accompanying text by the Saturn Recorders.

In addition, we have the observed intensities of different features in the rings in Table I on page 186.

Although not so much observational data were on hand as in some previous apparitions concerning the Ring System of Saturn, the writer is of the opinion that the lack of observations during critical times is the result of massive and lengthy amounts of inclement weather during the 1973-74 apparition. It appears also from the data on hand that the Ring System did not exhibit any unusual aspects, nor was much fine delineation of the low-contrast intensity minima observed in comparison to the previous (1972-1973) apparition. Excellent opportunities existed for some weeks on either side of opposition for critical examination of the rings, due to the increased brightness and greater apparent size.

RING A: Intensities derived from 14 observations by Haas and Heath indicate an average intensity value reasonably consistent with that for Ring A during the last two apparitions. Unlike the 1972-73 apparition, the region outside of A5 (Encke's Division) was indicated to be dimmer than that inside of A5. Apparently, no greater brightness was noted by either observer just outside of B10 (Cassini's Division) on the inner portion of Ring A, as had been noted during 1972-73. Heath, during the earlier part of the apparition, indicated that the colors - as well as the intensities - changed concurrently with one another on either side of the A5 division. The darker, outer portion was noted as "grey", and the brighter inner portion as "dull white" or "white." An averaged color estimate by Haas on March 17 was given as "bluish-white." A5 was regarded by most observers as a bit more difficult to resolve than in the 1972-73 apparition. Exceptions to this difficulty are observations by Heath indicating almost easy visibility of this division throughout the 1973-74 apparition. It is possible that the intensity of A5 may have decreased somewhat during the latter part of the apparition - possibly beginning in mid-February, 1974. Rather than noting a specific division throughout the apparition, Sherrod noted repeatedly a sudden distinct change in COLOR - brownish grey outside, abruptly changing to a light grey inside A5 - such a color contrast is difficult to distinguish from a true separation just at the line of color change (A5). Observers noting A5 all noted this division at the ansae, and its color was given as a very dark grey (intensity 2.30) - far from totally black.

RING B: The color for this ring component was strikingly white for the duration of the apparition. However, a gradation of hue was noted both by Heath and Sherrod, indicating a change to dull white or pale yellowish-grey for the inner 1/3 of Ring B. Heath indicated a clear border existing between the lighter and darker portion of the B Ring, and at one time suspected a gap or division at this point. Haas reported a consistent "white" for the whole of Ring B. Most observers reported that B10 (Cassini's Division) could be traced completely around the ring system, and was seen by many with smaller aperture telescopes as tangent to the globe of Saturn, and unresolvable at the point of "contact." Although quite dark, B10 never seemed to attain total "blackness" and was summed up as appearing very dark grey to black near the ansae with an intensity of only 0.27 - lower than the intensity of any other Saturnian feature. For all of Heath's observations the color of B10 was given as "quite black." Appearing of the same color (very dark grey) were the suspected minor divisions B1, B2, B5, and B7, all appearing only at the ansae and only on rare occasions. Although these divisions may be thought of as true physical divisions like Cassini's, the relative intensities and changing relative positions of these markings hint at "intensity ripples" (intensity minima) rather than true gaps - somewhat of a "thinning out" of ring particles allowing for observed intensities other than black (0.00). However, as a caution, we may also assume these to be quite thin gaps (as we would expect them to be); and this aspect considered with the relative brightness of the ring in which they

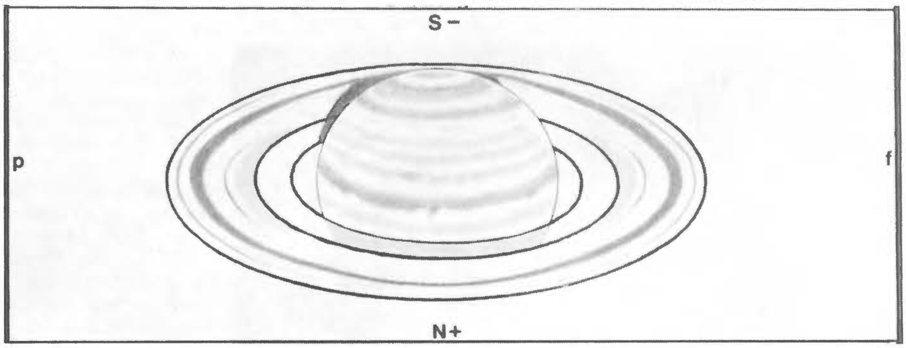

Figure 46. Drawing of Saturn by Charles F. Capen on October 11, 1973, 12^h15^m to 12^h 30^m, U.T. Lowell Observatory 24-inch Clark refractor. 830X. Seeing 9 (excellent). Transparency 6 (limiting stellar magnitude). Wratten Filters 12, 57, and 38. This drawing is upon a standard form of the A.L.P.O. Saturn Section.

are located would also give the appearance of greyish, rather than black.

RING C: Quite unlike the 1972-73 apparition, the Crape Ring was regarded as very difficult except near the ansae, and even there required rather good seeing. Heath reports this ring as very dark and commonly seen only at either ansa. An average intensity of only 0.91 was assigned to the portions of Ring C sighted in the ansae. Not much difficulty was encountered when observing the Crape Band, however; and photographs by Smith on January 28 indicate clearly the relative darkness of this ring where crossing the globe of Saturn. The remarkable distinctness of the Crape Band but not of Ring C at the ansae seems to be a curiosity.

The writer is tempted to speculate here on a correlation concerning the visibility of the C Ring. It appears that even observers using large telescopes and having better-than-average seeing conditions sometimes have difficulty viewing Ring C. At the same time, reports concerning many sightings of intensity minima appear to subside somewhat. It has been my personal experience that a bright Ring C is noted simultaneously with an increase in the visibility of much minor ring detail. It should be noted that great differences existed in the visibility of even Encke's Division (A5) during the last two apparitions as with the many minor intensity minima and the C Ring. Likewise, tracing back (i.e., in the 1968-69 apparition) there seems to be a tempting correlation. It would be wise to check ring intensities further during changes in the visibility of Ring C, using photoelectric devices and measuring the TOTAL intensity variation of the ring system during such a change.

The Bicolored Aspects of the Ring System (Mr. Sherrod)

It was a great disappointment that the prolonged brightening of the west ansa noted in the 1972-73 apparition was not visible throughout the 1973-74 apparition. Nor was any brightening suspected to last for more than one observation. On December 1 Haas reported the west ansa slightly brighter than the east as seen in a W-47 (blue) filter. On March 17 he noted the ansae equal in brightness in white, blue, and red light. However, nearer to the west horizon on May 26 Haas noted the east arm distinctly brighter with the W-47 filter, but without the filter both ansae were equal.

It is only fair here to establish two possible approaches to the problem of the bicolored aspect for the benefit of those devoting time to the study of this phenomenon. First, we have recognized that atmospheric dispersion, seeing conditions, moonlight, etc. can cause variable refraction of the light from either ansa - this is exemplified by the above noted case on May 26 by Haas. However, such conditions do not adequately explain many PROLONGED brightenings such as that of 1972. Variable refraction would tend to change as the planet attained and recessed from altitude during the night. One possible explanation for the prolonged brightening (and the only one available logically to us) is the true physical change of the particle concentration in various areas of the rings caused by satellite gravitational influences. If we accept the first approach and realize its effects, then we might probe further into the study of dynamic physical changes.

Two such studies were carried out during the 1973-74 apparition. Smith at the request of the Recorders carried out a program with his 16-inch reflector to note the change in apparent brightness for various orientations of the planet's image in the telescope tube. His finding: "I look at Saturn with the rings crosswise with the tube and I see the east ansa darker, but with the rings lined up with the tube both ansae are the same brightness - due to the position of the eye - maybe something like the moon near the horizon effect." Consequently, Smith arrived at the conclusion that the bicolored aspect might be illusory. Another study in North Little Rock by Evans and Sherrod was designed to eliminate personal bias and illusion by having two trained observers observe with the same telescope, same eyepiece, and as near to the same minute as possible - the result from over 150 estimates was that both observers noted the same changes, and these changes were noted as Satuen changed from moderate to low altitude. However, the study also indicated occasional illusory sensations by both Evans and Sherrod, but not so much to overrule the true significance of the findings.

The slight changes in ansae brightness noted in 1973-74 were such that we must assume that those changes were caused by a combination of illusion and/or atmospheric/seeing effects. We must emphasize, however, that we still DO NOT fully understand the fundamental changes well enough, and much more simultaneous work is required with Saturn at various altitudes in the sky. When we find these answers for atmospheric refraction, we can turn our much-needed attention to the mechanism responsible for the great prolonged physical brightenings.

BOOK REVIEWS

Mars, by Patrick Moore and Charles A. Cross. Crown Publishers, Inc., 419 Park Avenue South, New York, N. Y., 10016, 1973. 48 pages. Price $7.95.

Reviewed by Robert B. Rhoads, A.L.P.O. Assistant Mars Recorder

Within the span of a decade, more has been learned about the planet Mars than in the previous 300 years of telescopic observations. The book Mars presents the results from the Mariner 9 Spacecraft, but also provides background information which the beginning student of Mars will find of value.

The Chapter "Mars as a World" presents an illustration of the structure of the Martian atmosphere, including a discussion of different types of observed clouds. There are four photographs in different colors illustrating clouds; unfortunately, they are difficult to interpret since three of them are printed with East and West reversed on the planet!

"Historical Exploration" shows drawings and maps from Huygens in 1659 to Antoniadi and Lowell in the early 1900's, the latter's views about life on Mars having a profound influence on later thinking.

"Modern Telescopic Observations" discusses various dark areas on the planet, and includes six photographs. Four of the six captions, however, are in error, describing features at the wrong places on the disc, and even some that are not on the photographs!

The exploration of Mars by spacecraft began with the successful flyby of Mariner 4 in 1965. The Russians had attempted a flyby in 1962; but radio contact was lost, and the mission was declared a failure. The first successful Russian probes were Mars 2 and 3 in 1971. Mars 3 released a descent capsule to the surface, which although successfully landing, transmitted for only 20 seconds.

The chapter on "Surface Variations" describes the changing size of the Polar Caps, the dark Polar Collar, and the Wave of Darkening. During this century, large scale dust storms have taken place on Mars near the time of Perihelic Oppositions. The transport of dust by the Martian winds is important in the understanding of changes in the dark areas of Mars. Three chapters on topography describe the huge shield volcano, Nix Olympica, other volcanic areas on the planet, elevation differences (as great as 23,000 meters), and the Great Rift Valleys.

The charts of Mars showing the four quadrants and two poles have been drawn from the Mariner 9 photomosaics. Craters down to 10 - 20 kms. in diameter are shown. Accompanying each chart is a panorama showing photographs of selected areas on the individual chart. These are well done, and very informative.

A chapter on the satellites shows Phobos and Deimos, as viewed by the Mariner 9 cameras. The authors state: "From Mars, Phobos would have a maximum diameter of 12°3 reducing to 7°9 at rising or setting; this is less than half the apparent diameter of the moon as seen from Earth". The true average angular size of the Moon is 31'. A similar erroneous statement is made about Deimos.

"Future Exploration," the last chapter, describes the Viking Lander mission, and how it will search for life on Mars. We find the authors also speculating about the possibility of another Soviet attempt to land on Mars in 1976.

The book is beautifully illustrated in color, and the charts are useful and well executed. Unfortunately, the numerous errors, I should think, would be confusing to the armchair astronomer and to the beginning student of Mars.

* *

Intelligent Life in Outer Space, by Ronald N. Bracewell. W. H. Freeman and Co., 660 Market Street, San Francisco, California, 1975. 141 pages. Price $6.95.

Reviewed by Joseph P. Vitous

The author, a professor of electrical engineering now at Stanford, is a native of Australia, where he received degrees in mathematics, physics, and electrical engineering. With the advent of the Space Age, he has become one of the early contributors to discussions of life in space. This book reflects his interest in the subject. He takes up some of the fascinating questions raised by the possibility that we are not alone in space but is quick to point out that there is thus far no evidence of life elsewhere in the universe. He does not exclude the possibility that we are the only intelligent beings.

Chapter one delves into the origin of life, referring to the Darwinian theory of evolution--a controversial subject when applied to human beings. No mention is made of the fact that the Darwinian theory as it applies to man is still unproven.

In Chapter 4, reference is made to the cost and difficulty of interstellar voyages. No thought is given to the limitations of the human mind in its capacity to conceive the total immensity of the cosmos. The author discusses the physical exploration of the universe of which man is only capable of understanding an infinitesimally small part. This chapter also presents a discussion of radio telescopes and related terminology in a concise and readable manner.

The tremendous cost of any effort at communication with possible intelligent outer space beings, in terms of money and time, is noted in Chapter 6. Certain handicaps are pointed out which are aggravated by increasing distances and ultimately become overwhelming. Contacting a civilization 300 light-years distant would necessitate a wait of fully 600 years to receive an answer--the cost in time. The funding of such experiments could indeed present problems, according to the author. Attention is called to the limits of the human life span, and man's reluctance to contemplate programs which stretch over centuries.

At the end of Chapter 10, the author states that there is no existing scientific evidence that commands any wide assent regarding the Earth's having been visited by beings from space.

Segments of the book may appeal to the lovers of science fiction. In Chapter 12, on the possibility of interstellar travel the author makes this statement: "For each bit of science fiction that has come true, a great deal more has proven false." It is further indicated that with chemical fuels, such as are now used, the outlook for space travel is not favorable.

Chapter 13 presents fuel for controversy. The suggestion is made that to solve the problems of earthly overpopulation the "zero population growth is the only way to go." Personal convictions of many readers will be diametrically opposed to this philosophy. Where would we all be today had our respective parents adhered to that philosophy? How many potentially great minds would have been denied the right to life? Would the author be living today? Everyone has the inalienable right to be born.

Chapter 14, on the colonization of space, caters to the science fiction mentality with its Jules Verne concepts.

Of the 61 illustrations in this book, many are of a psychedelic and bizarre nature, which in this reviewer's opinion detract from the book and could well have been omitted.

In Chapter 15, the author leaves it to the reader to judge the probabilities of extraterrestrial life for himself.

* *

Highlights in Astronomy, by Fred Hoyle. W. H. Freeman and Company, San Francisco, California 94104, 1975. 197 pages. Price $5.50 paper, $10.00 cloth.

Reviewed by J. Russell Smith

It appears that this volume could be classed as a text and as a picture book in elementary astronomy. Almost every page has one or more photographs or a diagram. The six constellation charts are simplified, attractive, and well suited to one who is interested in learning the basic constellations. It would have helped if the list of constellations on pages 102 and 103 had been marked for pronounciation. Reading the book reminds one of a slide presentation where the lecturer instructs by using the photographs and diagrams. This method of teaching has proved to be excellent. The eight chapters are as follows: The Earth, The Planets and the Sun, The Planets, The Sun, Comets and Other Froms of Debris, Stars, Life in the Universe, and Galaxies and the Universe.

The book appears to have been hastily prepared and is not well edited. The sentence starting on page 2 and continuing on page 6 should read as follows: "Why can the whole round ball of the Earth be seen in Figure 1.4 and not in Figure 1.3?" On page 28, the author referes to the points A and B in Figure 2.2 (page 27); but when one examines Figure 2.2, he finds that the points have been omitted. On page 40 the author states that Saturn has nine known satellites when in reality it has ten. It would have helped the beginner if the caption for Figure 3.3 (page 42) had indicated that it is a portion of the Moon. This is indicated in the text on page 40.

The dark spot on the photograph of Jupiter (Fig. 3.17) should be identified as the shadow of Jupiter's satellite Io. The beginner will not know this, and he will think the shadow is the satellite. On page 39, Table 31, the author states that he does not list Pluto as a planet because many astronomers believe it is a satellite which has escaped from Neptune. However, on page 67 (Figure 4.1) Pluto is definitely considered to be a true planet. This confusion is probably the result of lifting Figure 4.1 from another book. The caption of Figure 4.4 (page 69) indicates only observations of sunspots. It appears reasonable to believe it also shows lunar sketches as well as the regular movement of Jupiter's four bright satellites which were discovered by Galileo in 1610. This inference should be explained for the beginner. In the United States, "X-ray" is generally accepted as the adjective and "X ray" is generally accepted as the noun. I refer to the use of these words on pages 74, 76, and 80. The word "star" is misspelled on page 106, line 9, left column.

These errors do not mean that the book is not a useful text. It simply means that the beginner will need guidance in those areas. Pages 172-175 contain an average of 10 questions based on each chapter of the text. This section is followed by a suitable index.

* *

The UFO Experience, by Dr. J. Allen Hynek. Ballentine Books, New York, by special arrangement with Henry Regnery Co., 1972. Ballentine edition published May, 1974. 309 pages. Price $1.50 (paperback).

Reviewed by Rodger W. Gordon

At last, after years of muddlement by cranks and weirdos, the U.S.A.F., and even so-called "top scientists", we finally have a top-flight book by a distinguished astronomer, Dr. J. Allen Hynek, which takes an objective look at the UFO situation. Dr. Hynek was for 20 years the astronomical consultant to the now discontinued U.S.A.F. Project "Blue Book", which was eliminated after the publication of the Condon Report, or as it was known officially, Scientific Study of Unidentified Flying Objects.

Dr. Hynek's book shows conclusively that the last word on UFO's has yet to be written. He also shows that the military handling of the UFO problem was just about as befuddled as anything could be with only a bare occasional light shed on the subject. Dr. Hynek points out that while the Condon Report purportedly showed no evidence of UFO's, the actual number of "unknown" phenomena observed which could never be identified ran close to 30% in the final analysis. Indeed, in one case (1957, Lakenheath, England), where multiple visual and radar sightings were made for several hours, the Condon Report suggested that genuine UFO's were involved.

Dr. Hynek's main theme is to show how the "strangeness" factor of UFO reports relates to the conclusion that genuine UFO phenomena are being involved. His criteria are strict. He usually discards sightings made by only one witness unless the credentials of the sightee are impeccable. He shows that in many "explained" reports the "explanation" derived was far more fantastic and less likely than an actual extra-terrestrial visitation.

After reading Dr. Hynek's book, this reviewer came to one conclusion: What a travesty to the scientific method, and an injustice to science as a whole, that a phenomenon begging for adequate investigation goes ignored by the scientific community. Whether or not you believe in an extra-terrestrial explanation of UFO's, you can not afford not to read this book if you have an open mind.

Dr. Hynek has set up his own organization for UFO reports and is trying to interest other scientists to help. There have been some signs of success. Four Ph.D. theses have been awarded on the UFO subject, and many colleges are offering courses about it.

The answer to the UFO problem will never come until the scientific community admits that a genuine unexplained phenomenon is actually occurring. The old trite standard clichéd explanations won't do. Few scientists, except one of Dr. Hynek's reputation, could do what he is now doing without being ostracized from the scientific community. This situation must be reversed so that scientists can tackle a controversial subject without the fear of ridicule or "blackmail". Dr. Hynek's book is the first step toward that desired goal.

* *

The Geometry of the Stars, by James P. Calk. Exposition Press, Hicksville, NY, 1975. 103 pages. Price $5.00.

Reviewed by Karl Simmons

Geometry is the mathematics of astronomy. Stellar systems can be surveyed, and their magnetic fields mapped, only through geometrical constructions. Although the axioms in classic plane geometry are self-evident factors that need no proof, the axioms in magnetic field geometry do. That proof has been Mr. Calk's aim in this book.

The magnetic fields of the extragalactic stellar systems, to be understood, must be mapped as a whole. Geometry is the only mathematical method which can be used to diagram the magnetic fields and to prove the facts of star creation. To do this, Mr. Calk first explains how the axioms are used in squares, circles, ellipsoids and spirals, then discusses the two major types of spiral nebulae found and how the gravitational field affects magnetic fields. After this step, he turns to the specifics of the systems - the hub formation, the spiral arms, the barred galaxies, and the Milky Way in general.

Then elaborating on all the concepts, he proceeds to the galaxies themselves: Silver Dollar (NGC 253), Four-Armed (NGC 6946), Diamond (NGC 4303), Great Magellanic Cloud, and numerous others - giving complete diagrams for each.

The Geometry of the Stars is a book which readers with only a little geometrical background will easily understand and enjoy.

* *

The Jupiter Effect (The Planets as Triggers of Devastating Earthquakes), by John Gribbin and Stephen Pagemann. Walker and Co., 720 Fifth Ave., New York City, N.Y. 10019 1974. 136 pages. Price $7.95 hardback.

Reviewed by Paul K. Mackal

This skillfully written and edited book has all the scientific rigor of a Ph.D. paper, but is also artfully written like a detective story with the high school science student in mind. Beginning with a discussion of faults in the Earth's crust and a restatement of the floating continent hypothesis, it outlines major causes of earthquakes in San Francisco and Los Angeles on or near the San Andreas fault, due to impact of the American continental plate into and alongside the Pacific continental plate--the resultant sliding and vertical motions thereby generated--resulting in periodic Earth tremors or quakes. Other force vectors include the pile up of the Pacific plate onto the American plate, counteracting "slippage" and "passage" of same, thereby locking together the fault in several places so that stress can be stored and eventually mount up, producing a quake of greater intensity.

The authors next address themselves to the time of the next major earthquake to be expected in California, and conclude that by virtue of compression of the plates near Los Angeles at 6 cm/year, accumulating to 9 meters by 1982, this is the most likely spot for a major earthquake. I.e., a long expected conjunction of planets in 1982 will coincide with the stress factor to trigger an eruption in Los Angeles.

Astronomers have long wondered what role gravitational forces of the Moon, the Sun, and the planets have had in triggering the major earthquakes--not to mention volcanic activity. Astonishingly, the authors conclude that air column weight changes during sunspot maxima play a role in facilitating such outbreaks, because greater changes of same are related to the gravitational effects of Mercury, Venus, Earth, and Jupiter—all on the earthside line of conjunction! Increased solar magnetic activity at a time of sunspot maximum to begin with on its farside is hypothesized to shift the Earth's rate of rotation, increasing the length of the day (as a function of a decrease in cosmic wave rays, reaching Earth after solar outburst, due to the solar wind increasing and the Sun's magnetic field expanding) and consequently jolting the plates into one another, thereby unlocking them! In this reviewer's opinion, however, the gravitational effect on Earth, not the Sun, is far more important.

The authors tend to forget the theory of the formation of the Moon suggested by Darwin, or the fact that the Moon has been closer to Earth on previous occasions, rendering a gravitational cause for lunar volcanism, tectonic lines on the lunar surface, freezing of the lunar face towards the Earth after the advent of volcanism on the near and the far sides of the Moon, breaking up and drifting of the Earth's super-continents and continents, plus major outbreaks and eruptions on the Earth's surface. This all resulted in the change of the Earth's temperature--hot periods and ice ages, even magnetic polar flips may be explained in this fashion!

When they state that ocean trenches take debris down from the thinner ocean plates, they assume the material is made molten, only to be redistributed randomly at flexure lines--between parallel fault lines involving antagonistically moving sheets of the ocean floor away from the flexure lines and towards the trenches and continental shelves. But this debris could be recycled under the crust in pieces and eventually piled up at the flexure lines by ordinary friction and the Newtonian law of action and reaction sliding the matter over the viscous mantle in a non-random fashion. Finally, as to sunspot activity influencing the weather, a sideline the authors discuss, the reviewer notes that this is highly local--producing either a drought or a rain cycle--usually in consecutive 10 year periods: (1) 5 years into a sunspot maximum period and 5 years into a following sunspot minimum period attended by sky clearing in the northern hemisphere, e.g., and atmospheric heat loss--the clear skies being a negative feedback system independent of magnetic activity of the Sun; and (2) 5 years of minimum and then 5 years of maximum, resulting in cloud cover build up, rain and storming, and heat entrapment in the same hemisphere, with cloud cover itself being a negative feedback system, reversing the sequence of events once again.

Postscript by Book Review Editor. A paperback edition of The Jupiter Effect can now be bought for $1.95 from Vintage Books (a division of Random House, Inc.), 201 East Fiftieth St., New York, N.Y. 10022.

* *

Astrophysics of Gaseous Nebulae, by D. E. Osterbrock. W. H. Freeman and Company, 1974, 251 pages, 56 illustrations, price $17.00.

Reviewed by Dale P. Cruikshank, University of Hawaii

Who among us hasn't aimed a small telescope at the Orion Nebula, the Ring Nebula in Lyra, or any of a number of faintly luminous, amorphous glowing patches in the sky, and stared with wonder at the nature of these strange celestial objects? Modern astronomy has shown that there are several classes of these non-stellar luminous clouds of gas, though most are associated closely with stars. Osterbrock's new book discusses the wide range of observational material on gaseous nebulae, acquired with both optical and radio telescopes, and explains the detailed physics of their emission of light and radio radiation.

This book treats the physical processes of gaseous nebulae using physics and mathematics that should be within the grasp of university juniors. It is a lucid, succinct, and up-to-date review of the current understanding of these fascinating objects which inhabit our galaxy and others. Graduate courses in the physics of the interstellar medium and related topics can make good use of this book as a text to be supplemented by outside reading. The basic processes in gaseous nebulae are understood, thanks to the painstaking efforts of a dozen or so astronomers and astrophysicists over the past few decades; and Osterbrock's book is a fine introduction and a review of their results for readers understanding basic physics and mathematics.

THE COMING TOTAL LUNAR ECLIPSE OF NOVEMBER 18-19, 1975.

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

The third total lunar eclipse in 12 months will occur on the night of November 18-19, 1975. Unfortunately, this event will be only partially visible from the United States; the portion visible will range from shortly before totality on for East Coast observers, to only the final penumbral stages for West Coast viewers. The Moon will be located in the constellation Taurus, ca. 5° south of the Pleiades cluster. The magnitude of the eclipse will be 1.068; since the dividing line between a partial and a total lunar eclipse is 1.000, this value suggests that totality will be brief--actually, it is predicted to last only 41.5 minutes (versus 89 minutes for the May 25, 1975, eclipse).

The table below gives the Universal and Local Standard Times predicted for the various eclipse phases.

	Nov.18-19,1975	November 18, 1975			
Phase	U.T.	EST	CST	MST	PST
Moon enters penumbra	19:25.5	(14:25.5)	(13:25.5)	(12:25.5)	(11:25.5)
Moon enters umbra[a]	20:38.6	(15:38.6)	(14:38.6)	(13:38.6)	(12:38.6)
Total eclipse begins[b]	22:02.6	17:02.6*	(16:02.6)	(15:02.6)	(14:02.6)
Middle of the eclipse	22:23.4	17:23.4*	(16:23.4)	(15:23.4)	(14:23.4)
Total eclipse ends[c]	22:44.1	17:44.1*	16:44.1*	(15:44.1)	(14:44.1)
Moon leaves umbra[d]	00:08.2	19:08.2	18:08.2*	17:08.2*	(16:08.2)
Moon leaves penumbra	01:21.1	20:21.1	19:21.1	18:21.1	17:21.1*

Notes

() Moon below horizon at 40° North on standard meridian.

* During astronomical twilight.

[a]First contact (PA 058°). [b]Second contact. [c]Third contact. [d]Fourth contact (PA 287°).

Because of the poor visibility of this eclipse, American observers will be able to make only a few types of useful observations, and even those will be restricted to sites in the eastern portion of the United States:

1. Because of twilight conditions, it is likely that no American observers will be able to make reliable estimates of the Moon's apparent magnitude or Danjon luminosity during totality. (Magnitude estimates after totality will be possible, but will be of less value.)
2. Eastern observers should be able to time third and fourth contacts and to describe the sharpness and tone of the umbral edge, and the visibility, color, and tone of the penumbra during emersion.
3. Eastern observers should also be able to make crater-umbra contact timings during emersion.
4. Depending on one's location, during emersion striking photographs of the Moon and the Pleiades against the twilit sky should be possible.

For details on conducting particular types of lunar eclipse observations, see: Westfall, J. E., "Observing Lunar Eclipses," J.A.L.P.O., 25 (March, 1975), pages 85-88. Lunar Eclipse Observation Forms may be obtained by sending a stamped, self-addressed envelope to the writer.

MELLISH AND BARNARD - THEY DID SEE MARTIAN CRATERS!

By: Rodger W. Gordon

In December, 1974, I wrote an article for the Lehigh Valley Amateur Astronomical Society newsletter, "The Observer", entitled "Craters on Mars: An Historical Aspect". This article gave a review of past ideas by various astronomers and writers regarding the nature of the Martian surface. The main theme of the article was to show that the concept of craters on Mars ("Pickering's Oases") and extensive volcanism on the planet had been suggested many times before the Mariner IV observations of July 14-15, 1965. Some of the persons involved in these various ideas were Pickering, D. Cyr, Tombaugh, Mellish, and Barnard. A major portion of the article dealt with the possible observations of the Martian craters by Mellish and Barnard around the turn of the last century[1]. This portion of the article drew heavily upon a letter John Mellish sent to Sky and Telescope and published in the June, 1966 issue, page 339 and also upon an article in the February, 1971 Journal of ALPO, page 215, by Eugene Cross. I lamented the fact that we had only the Mellish and Cross articles to draw upon, but that in a book "Flying Saucers: Fact or Fiction?", by Max B. Miller, 1957, page 54, there appeared a confirmatory statement supporting Mellish's observations of the Martian oases as crater pits.

Shortly after the publishing of my article, an L.V.A.A.S. member, Mr. Walter Leight, who had corresponded with John Mellish for several decades prior to Mellish's death in 1970, came across some very valuable information. Incidentally, Mr. Leight was one of the early ALPO members and an observing associate of Director Haas when he lived near Philadelphia in the early 1940's. Mr. Leight found a letter dated January 18, 1935, from John Mellish which clearly established that both Mellish and Barnard did indeed telescopically observe craters on Mars. Here is a portion of Mr. Mellish's quotation in that letter published in the Feb., 1975 L.V.A.A.S. "Observer"[2]:

"There is something wonderful about Mars. It is not flat, but has many craters and cracks. I saw a lot of the craters and mountains one morning with the 40" [Yerkes refractor] and could hardly believe my eyes. That was after sunrise and Mars was high in a splendid sky. I used a power of 750 and after seeing all the wonders, I went to Barnard and showed him my drawings, and told him what I had seen. I had never heard of any such thing ever having been seen, and he laughed and told me he would show me his drawings made at Lick in 1892-93. He showed me the most wonderful drawings that were ever made of Mars. The mountain ranges and peaks and craters and other things, both dark and light, that no one knows what they were. I was thunderstruck and asked him why he had never published these. He [Barnard] said, no one would believe him and [others] would only make fun of it. Lowell's oases are crater pits with water in them, and there are hundreds of brilliant mountains shining in the sunlight. Barnard took whole nights to draw Mars and would study an interesting section from early in the evening when it was coming on the disk until morning, when it was leaving. He made the drawings four and five inches [in] diameter and it is a shame that those were not published. I do not know as anyone would be allowed to even look at them now. They are at Yerkes and will stay burried I suppose."

Another letter to Mr. Leight dated June 6, 1966 was also found (after the Mariner IV observations) in which Mellish mentions the fact that the Jet Propulsion Laboratory contacted him regarding his crater observations of Mars in 1915, and also the fact that JPL tried to find Barnard's 1892 drawings of craters, but could not locate them.

In the 1935 letter Mellish mentioned that he had done optical work for Lowell Observatory instruments, but that Lowell astronomers could never see the details in his (Mellish's) drawings with the instruments at their disposal. In his 1966 letter to Leight, he mentions that all his drawings were destroyed in a fire as well as all his optical equipment.

Since the discovery of the 1935 Mellish letter and the publication of excerpts from it in the Feb., 1975 L.V.A.A.S. "Observer", we have discovered additional information which supports both Mellish and Barnard, and Mellish apparently either wrote about his observations to many observers or perhaps had some observations published in an obscure journal now forgotten by everyone.

Mr. Stephen Zuzze of the Amateur Astronomers Association of New York City read my December, 1974 article and searched the files of the science section of the N.Y. C. Public Library. His findings were reported to George Maurer of our society, who in turn passed them on to me. The most interesting part of Mr. Zuzze's findings was that the great lunar observer H. P. Wilkins was aware of Mellish's crater observations on Mars. The following quotation is from the "Smithsonian Treasury of Science," Volume 1 (of 3 volumes) published by Simon and Schuster, 1960, page 122, and taken from a report written in 1956 by H. P. Wilkins titled "The Mysteries of Mars" (revised in 1959): "An American Observer, John E. Mellish, declares that with the 40" refracting telescope at the Yerkes Observatory, the largest instrument of its type in the world, the canals appeared as cracks, wide and eroded down, comparatively shallow, and filled with water. The dark round spots which Lowell believed to be cities, oases in the desert, were seen by Mellish as craters, presumably of volcanic origin and also filled with water."

Also, on page 122: "The regular appearance of the isolated dark spots, Lowell's cities, was also to some extent broken down into collections of separate dots with the Meudon telescope [33" refractor used by Antoniadi]. On the other hand, Mellish regards them as craters and therefore regular".[3] Mr. Zuzze suggests this original article by Wilkins may have been the source of Max Miller's statement in "Flying Saucers: Fact or Fiction?", 1957, page 54, quoted here: "Another observer, American John E. Mellish at the 40" Yerkes refractor, said that the Martian canals were nothing more than water-filled cracks and the oases merely volcanic crater pits on the planet's surface."

Mr. Gary Becker, editor of our L.V.A.A.S. newsletter, and I have been in contact with the editor of Sky and Telescope, Dr. Joseph Ashbrook. Dr. Ashbrook has suggested to us that the missing Barnard observations mentioned by Mellish in the Sky and Telescope letter of 1966 may not be at Yerkes after all, but rather at the Joint University Libraries at Vanderbilt University in Nashville, Tennessee. According to Dr. Ashbrook, there is 16 feet of shelf space devoted to Barnard's material from 1888 to 1923; and it comprises some 15,000 items, including a manuscript, almost complete, for a Martian treatise which was never published. Dr. Ashbrook quoted the new Dictionary of Scientific Biography for this latter piece of information.[4]

In a letter to me dated Feb. 13, 1975, Director Haas mentions an early meeting of the Western Amateur Astronomers in San Diego around 1950 where Mr. Mellish gave a talk on his and Barnard's observations of the Martian craters; but unfortunately Mellish did not use any prepared text, and this "paper" was never published in any convention Proceedings.[5]

On page 151 of the book Elements of Descriptive Astronomy by H. A. Howe, 1897, 1909 copyright, is a drawing of Mars by Barnard dated August 19, 1892. No other data are given, but the region near the CM is the Solis Lacus-Candor region. Barnard shows Juventae Fons as a small dark spot and several other spots, one of which is probably Lacus Phoenicis. He also draws 3 canals in the style later adopted by Lowell, that is to say, narrow fine lines. It is often stated Barnard never saw or drew the canals, but such is evidently not true. Since Lowell did not start observing Mars until 1894, we can only assume that Barnard's style was heavily influenced by Schiaparelli.

If one carefully examines the Mellish letters, there are only minor discrepancies between his 1935 letter to Leight and his 1966 letter in Sky and Telescope. He mentions using 750X in his 1935 letter, but 1,100X in his S. and T. letter. He gives 1916 as the year of the observations in the S. and T. letter, but 1915 in the 1935 letter. In the article by Cross in Journal of A.L.P.O. mentioned earlier, the date is given as Nov., 1915. Obviously, these discrepancies are minor; and as Mellish was 80 years of age in 1966, it is only to be expected that his memory may have failed him on a minor point or two. Yet his 1935 letter (written at age 49) is very similar in general content to the 1966 letter, and there appears to be no reason for doubting their validity in the light of all the other evidence.

It is very interesting to get an idea of the extraordinary circumstances which must have prevailed for Mellish to get his Nov., 1915 observations. According to Earl C. Slipher's Mars, The Photographic Story, published in 1962, the 1916 opposition of Mars occurred on Feb. 9 with Mars attaining a maximum diameter of only 13".9; it was therefore the most aphelic opposition since 1901. Since Mellish observed in November of 1915 when Mars was near its maximum phase gibbosity of 88% of full illumination, the actual disc diameter could not have been more than 8" or 9" of arc. If we assume that the disc was 9" in diameter and Mellish used 1,100X, the apparent size of the Martian disc in the telescope would then be 9,900 seconds or approximately 165 minutes of arc. Since the lunar disc to the naked eye subtends 30' ($\frac{1}{2}^{\circ}$), it is obvious that Mr. Mellish saw Mars no larger than we would see the Moon with a pair of 6X binoculars. If we use the more conservative figures of 8" and 750X, we get 6,000 seconds of arc or 100 minutes, about the equivalent of a pair of modern opera glasses in a lunar view. One can see craters on the Moon with these low magnifications, though.

Mellish mentions his largest crater as being about 200 miles in diameter. Since Mars is 4,200 miles in diameter, such an object on a 9" disc would only subtend about 1/20th the diameter of the planet or in this case less than half a second of arc. This is well within the theoretical resolving power of the Yerkes 40" refractor, which approaches 0".1. Mellish states that he saw many smaller craters also.

It would appear, then, from optical considerations that Mellish's observations are well within theoretical parameters. Indeed, Mellish mentioned that diaphragming the objective of the 40" to 24" aperture caused the craters to disappear.[6] It is also apparent that the unusually good seeing conditions Mellish encountered plus the favorable gibbous phase of Mars allowing the craters near the terminator to have some shadow relief account for his being able to see these objects.

Barnard may have encountered the same conditions in 1892-93; but until someone recovers the missing Barnard observations, we are likely to remain in the dark on that point.

It also appears that given the right conditions, the giant reflectors should be able to duplicate the Mellish-Barnard observations. It will be interesting to see if this is done in later Mars apparitions.

The most important thing right now would be recovery of the missing Barnard drawings so that they can be compared to modern day Mariner close-encounter pictures for correlation. Mellish says his 200-mile diameter crater was near -50° south latitude. If so, we have a clue as to which object it might have been. There is a large crater near Electris at -48°, 170°, another in Aonius Sinus at -52°, 115°, another at -52°, 81°, a large crater in Argyre I at -51°, 32°, and a last object near Noachis at -53°, 9°. Mellish states there were many bright rimmed craters just north of it, and each one of these areas would qualify for that description. The two most likely candidates, however, would be the large crater near Electris at -48°, 170° and the large crater in Argyre I at -51°, 32°. Both these objects are about 150-200 miles in diameter. There are, it is true, 2 large craters near -47°, 341° and -47°, 218° (near Noachis and Eridania respectively); but these are somewhat smaller than the two best candidates. Yet none of these objects can be ruled out, and without further information we are at a dead end. Mellish sent some of his drawings made with the 40" to other observers in 1915-1916; but so far Mr. Leight has only been able to find drawings Mellish made with the 12" refractor at Yerkes in 1915, though in his 1935 letter he stated one of the drawings sent to Mr. Leight (a photo plate of the drawings) was done with the 40". Let us hope that the Mellish drawings are someday found also.

It is sad that Barnard, greatest planetary observer of his day, did not publish his observations of craters, feeling that he would only be subject to ridicule. This tells us something of the astronomical climate of the time; and it is regrettable that Barnard felt his reputation was not enough to survive the controversy publication of his results would, he felt, certainly bring forth. Such a climate should never be allowed again. Barnard described his observations of Mars in 1894 and in particular the dark areas as looking like a rough mountainous countryside as seen from a great height and broken by canyon, ridge, and slope.[7] But this description, though tantalizing, lacks the word craters. Mellish, though, as far as we can discover did not publish anything formally but apparently had no qualms about discussing his (and Barnard's) unique observations or writing about them to other observers of his acquaintance. Let us hope that the future will bring us more information on this fascinating aspect of astronomy.

The author wishes to thank the following individuals for their help in various ways, either directly or indirectly: Messrs. George Maurer, Gary Becker, and Walter Leight of the L.V.A.A.S.; Joseph Ashbrook of Sky and Telescope, Director Walter Haas of the A.L.P.O., and Stephen Zuzze of the Amateur Astronomers of N.Y.C. Also, a special thanks to my wife Irene, who had to decipher the author's handwriting when typing the manuscript.

References

1. L.V.A.A.S. "Observer", Dec., 1974, pp. 3-5.
2. L.V.A.A.S. "Observer", Feb., 1975, pp. 3-4.
3. Mr. Stephen Zuzze: Private communication to George Maurer.
4. Joseph Ashbrook: Private communications to Gary Becker and Rodger Gordon, Feb.6, 1975 and Feb. 13, 1975.
5. Walter H. Haas: Private communication to Rodger Gordon, Feb. 13, 1975.
6. Modern Astronomy, Nov.-Dec., 1974.
7. Elements of Descriptive Astronomy, published by Silver-Burdette, Copyright 1897, 1909, page 152.

Recommended Articles and Books

1. Donald Lee Cyr, Life on Mars, Pasadena, 1944.
2. Donald Lee Cyr, "Marsitron Hypothesis", Strolling Astronomer, Sept.-Oct., 1956.
3. Clyde Tombaugh, "Geological Interpretation of Martian Features", Strolling Astronomer, Oct., 1950.
4. John E. Mellish, Sky and Telescope, June, 1966, "Letters".
5. Eugene Cross, Jr., "John E. Mellish: Telescope Maker, Astronomer, and Naturalist", J.A.L.P.O. (Strolling Astronomer), Vol. 22, Feb., 1971.
6. Modern Astronomy, Nov.-Dec., 1974 (essentially a reprint of reference 5).
7. Max B. Miller, "Flying Saucers: Fact or Fiction?", 1957, Los Angeles - Mars Chapter.
8. Smithsonian Treasury of Science, Vol. 1, Mars Article, 1960.
9. Celestial Objects for Common Telescopes, Rev. T. W. Webb, Dover Books, 1962 (revised and enlarged publication of Sixth Edition, 1917, by Rev. T. E. Espin). See footnote on page 173 for comment on Pickering's "oases".

Postcript by Editor. Writing on August 7, 1975, Mr. Gordon informed the Editor that Dr. Carl Sagan has become interested in the historical problem of the Barnard-Mellish observations of craters on Mars. 'He (Sagan) informs me that he was in contact with Director Heiser of Vanderbilt University. Dr. Heiser found Barnard's unpublished Mars manuscript, but no mention of the craters is made (or drawings either)." It is not certain, of course, that nothing exists of Barnard's Mars drawings in the considerable material at Vanderbilt since it is not certain from the above that an exhaustive enough search has yet been made. Can anyone undertake to do so?

The Editor remembers an incident during a visit he made to the Yerkes Observatory in 1937. When the 40-inch refractor was briefly turned on Mars one evening, a long-time staff member asked whether I saw canals on Mars. He then went on to state that Barnard, whom he had known well, saw no canals but did observe cracks, mountains, and other features which no other observer had ever reported. I cannot be sure from memory whether Barnard's old associate specifically mentioned craters. It was very clear, though, that he and Barnard held a low opinion of the Mars observations made by Lowell and his followers. Perhaps this event is chiefly significant as suggesting that Barnard's unpublished and unique records on Mars were probably known to a fair number of his closer associates. Unfortunately, few or none of them can still be alive or mentally competent.

1975 CONVENTION OF THE SOUTHWEST REGION-ASTRONOMICAL LEAGUE

By: Harold Anderson, Chairman, Southwest Region Astronomical League

On July 11th, 12th, and 13th, 1975, the South Plains Astronomy Club, Lubbock, Texas hosted the convention of the Southwest Region of the Astronomical League. A.L.P.O. member Charles "Chick" Capen of Lowell Observatory was a featured speaker. Other A.L.P.O. members attending included Derald and Denise Nye, Longmont, Colorado and J. Russell Smith, Waco, Texas.

Also held in conjunction with the A.L. convention was a Neighborhood Astronomy Meeting for professionals. Both amateurs and professionals were free to attend the papers given at each meeting. The luncheon and dinner on July 12th were attended by both groups. The luncheon speaker was Dr. Ronald C. Kirkpatrick of Los Alamos Scientific Laboratory. The subject of his talk was "Planetary Nebulae-What We See and What We Know". Chick Capen was the dinner speaker and spoke on color in the Solar System.

Another highlight of the convention was a talk by Robert Fried, President of the Astronomical League, on his observatory in Atlanta, Georgia. He has a 16" reflector under his 14 foot dome. The observatory is complete with electronics and other equipment most amateurs only dream of. Dr. J. Dexter Eoff of Ballinger, Texas showed the group a simple and very accurate way to align a Newtonian. Ron Price, president of the TEXAS ASTRONOMICAL SOCIETY, Dallas, Texas spoke on 'High Resolution Planetary Photography". Excellent examples of his planetary photography appear on pp. 408 and 409 of the June, 1975 SKY AND TELESCOPE. J. Russell Smith spoke on the construction of his Skyview Observatory, located in dark skies about 20 miles from Waco, Texas. Derald Nye had some excellent color photographs of the 1974 solar eclipse. His photographs were taken from the ship Canberra off the coast of Africa.

Star parties were held on both July 11th and 12th at the home of Harold Anderson. His observatory with a 10" Newtonian was featured in the April, 1975 SKY AND TELESCOPE, pp. 211 and 212. Although both nights were poor for viewing, many persons enjoyed sitting in the observatory talking about the speakers of the day and their own personal observations.

Sixty-nine amateurs and fifteen professionals attended the two conventions.

THE NEW COMET KOBAYASHI-BERGER-MILON 1975h

By: Dennis Milon, ALPO Comets Recorder

During July and August, 1975 amateurs have had a naked eye comet to watch as it moved from Aquarius to Leo. Its nearly all-night visibility and easy sighting in binoculars encouraged observation, while the very rapid motion made it an interesting object; it moved about 6° per day when closest to the Earth on July 21st at a distance of 0.259 Astronomical Units.

The comet was first seen by Toru Kobayashi in Japan on July 2nd, 1975. This experienced observer uses a 6-inch RFT and was the independent discoverer of Comet 1970m. An independent discovery was made by Douglas Berger of Union City, California, while at a club star party in a state park. Berger was using a homemade

8-inch, f/8.5 Newtonian to find M2 after Deborah Moore had spotted this globular in a 3-inch. Instead, he came upon the comet and shortly notified nearby Lick Observatory of his find. Others in the group at Henry Coe Park were Gerald W. Rattley, Don McGlauflin, and Jack Zeiders.

Comets Recorder Dennis Milon found 1975h at 2 A.M., MDT on the morning of July 7th while observing with a 4-inch Fecker Celestar reflector in Yellowstone National Park in Wyoming. I was set up in a parking area on Mount Washburn at 8,752 feet when I looked at M2 in Aquarius; and the comet was in the same field,

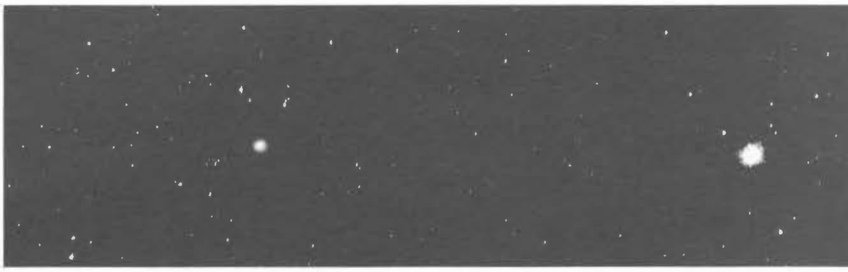

Figure 47. Photograph of Comet 1975h Kobayashi-Berger-Milon by T. Seki, the famous Japanese comet hunter, on July 7.6, 1975, Universal Time from Mr. Seki's Geisei Observatory. The comet was passing half a degree east of the globular cluster M2. Comet left of center, M2 near right edge. 10-minute exposure with 40-cm. f/5 reflector. On the same morning Seki made a visual stellar magnitude estimate of 7.5 and a coma diameter estimate of 15' with 7X50 binoculars. There were a number of independent discoveries of 1975h near M2. North in sky at top.

* *

just $\frac{1}{2}^{\circ}$ east of the globular. Using coördinates from the Vehrenberg Atlas of the Constellations, I plotted M2 on the Atlas Eclipticalis and determined which object was the comet and which was M2. The motion during an hour (6' north) was found by sketching nearby stars in the 4-inch, while a position was plotted from the view in tripod-mounted 7X35 binoculars. Checking the *Handbook of the British Astronomical Association*, I determined that there was no periodic comet in the area. In binoculars the coma diameter was 10 minutes of arc, as compared with two stars lying north-south of each other, whose separating distance was measured on the Atlas. An out-of-focus comparison with stars (whose magnitudes were later found in a catalog) gave a magnitude of 7.1. A central condensation was easily seen in the 4-inch. I left the mountain at 4 A.M. MDT and one hour later telephoned a report to Brian Marsden in Cambridge, Mass.

After driving back to Cambridge, I sent out the first Comets Section mailing about 1975h on July 14th with an ephemeris by Zdenek Sekanina of the Smithsonian Observatory; this mailing went to over 200 observers. On July 23rd I sent R. B. Minton's ephemeris, extending data to the end of October. By mid-August over 300 observations and photographs by 50 observers had been received and acknowledged by card, and some of these were exhibited at the ALPO Convention in San Francisco in early August.

The comet was visible in the evening sky until the end of August, and after perihelion (September 5th) was expected to be seen in the morning sky near the end of September and in October. However, it will never reach an altitude of more than 13° (in the United States?-Editor) before the start of nautical twilight, while its brightness will fade from $6\frac{1}{2}$ to 9th magnitude in October. The following 1950 coördinates were supplied by R. B. Minton, Tucson, Arizona: Sept. 30, 1975, $10^h28^m.0$, -0° 24'; Oct. 5, $10^h29^m.0$, -5° 40'; Oct. 10, $10^h30^m.4$, -10° 44'; Oct. 15, $10^h32^m.0$, -15° 35'; Oct. 20, $10^h33^m.5$, -20° 17'; Oct. 25, $10^h34^m.8$, -24° 48'; Oct. 30, $10^h35^m.8$, -29° 11'; Nov. 4, $10^h36^m.4$, -33° 25'; Nov. 9, $10^h36^m.2$, -37° 30'.

Summary of Observations in July and August

Magnitude. The magnitude was predicted to brighten until July 29th, when a slight fading would occur until mid-August after which it would return to the same level. Then the brightness would increase to about $3\frac{1}{2}$ until the comet was lost in the evening twilight. An analysis of 48 ALPO observed magnitudes in July was made by Charles S. Morris at Purdue University, giving: magnitude = 7.41 + 5 log delta + 11.16 log r, where the absolute magnitude is 7.41, with a probable error of ± 0.09 and n is equal to 4.46 ± 0.41.

Many observers reported seeing 1975h with the naked eye when there was no moonlight interference. On August 4th Derek Wallentine, observing west of Albuquerque, New Mexico, estimated 4.0 with the unaided eye, by comparison with four stars listed in the Skalnate Pleso Catalogue. On Aug. 7th John West at Bryan, Texas, called it 4.2 in 7X35's, using the Arizona-Tonantzintla Catalog.

When the comet is fainter in the morning sky, comparison star magnitudes can be obtained from the Yale Catalog or Skalnate Pleso. Below mag. 6½ the Smithsonian Catalog will have to be used, but with caution because various sources were used in its compilation; thus it is best to employ several sets of stars and then take an average. Another possibility is the use of AAVSO charts, when the comet is near a suitable field.

Coma. One of the most interesting aspects of 75h was the large coma diameter, up to $\frac{1}{2}^{\circ}$ in July. In a dark sky, most telescopic observers noted the coma as blue or blue-green, and color photographs showed a strong blue color. As the comet approached the Sun, the nucleus became more sharply defined, but may have become diffuse again in August. Charles Morris studied some ALPO reports in July and found an average coma diameter of about 400,000 kilometers. By mid-August the coma had decreased to about 12'.

Tail. In mid-July the narrow gas tail was seen only on photographs, but later could be easily detected in binoculars. The longest length reported was by Jim and Karen Young at Table Mountain Observatory in California; they saw 7° in 7X50 binoculars on August 2nd, UT, equal to nearly five million miles. On August 7th Charles Morris could see a $4\frac{1}{2}^{\circ}$ tail, and at Stellafane on the 10th John Bortle estimated 4 3/4° (4½ million miles). The visibility of the tail varied from day to day, according to R. B. Minton, who photographed it with a 5-inch and an image tube. On some dates it was only two minutes of arc wide on photographs, but visual observers noted a wider hood equal to the coma size. On August 3rd J. Russell Smith of Waco, Texas, using a 16-inch, drew a faint spiked tail and, with difficulty, a streamer on each side.

Figure 48. Photograph of Comet 1975h Kobayashi-Berger-Milon on July 12.38, 1975, Universal Time, by John Sanford of Orange, CA. He used 103a-E in an 8-inch Celestron. The comet moved 1.4 minutes of arc north during the 7-minute exposure and is hence a long streak while the stars are points. In July and early August the motion of the comet across the star background was easily noticeable to a visual observer in 5 or 10 minutes.

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The Recorder extends his thanks for the many reports. I would appreciate receiving additional observations on the standard ALPO comet forms for visual and photographic observations. Observations have been received from the following persons: James E. Adams, Jr., Vincentown, N.J.; G. E. D. Alcock, Peterborough, England; Dennis Bohn, Mt. Horeb, Wis.; John Bortle, Stormville, N.Y.; Dennis Cassia, Thornwood, N.Y.; Kenneth J. Delano, Fall River, Mass.; William G. Dillon, Springfield, Va.; Rodger and Irene Gordon, Nazareth, Pa.; John and Helen Huling, Elkhorn, Wis.; M. V. Jones, Brisbane, Australia; Mark Jones, Maryland Heights, Mo.; Larry F. Kalinowski, Roseville, Mich.; Bruce A. Krobusek, Chagrin Falls, Ohio; John Laborde, Santee, Calif.; Rainer Lukas, Berlin, West Germany; Anthony Mallama, Seabrook, Md; Vic Matchett, Brisbane, Australia; Leonard Matuszewski, Paramus, N.J.; Marvin Mayo, Wrightwood, Calif.; Mark McConnell, Horseheads, N.Y.; Claude McEldery, Dearborn, Mich.; R. B. Minton, Tucson, Ariz.; R. J. Morale, Tucson, Ariz.; Charles S. Morris, West Lafayette, Ind.; Wolfgang Mühle, Stuttgart, West Germany; Alan Pattee, Vestal, N.Y.; Logan Rimes, Houston, Tex.; Tim Robertson, Sepulveda, Calif.; John Sanford, Orange, Calif.; Friedrich Seiler, München, West Germany; Terry Shaw, Monona, Wis.; Clay Sherrod, North Little Rock, Ark.; Karl Simmons, Jacksonville, Fla.; Walter A. Singer, Keene, N.H.; Doug Smith, Rochester, N.Y.; J. Russell Smith, Waco, Tex.; Paul E. Stegmann, Fairview, N.J.; Harold Stelzer, River Forest, Ill.; Chris Stephan, Chagrin Falls, Ohio; Richard A. Sweetsir, Jacksonville, Fla.; Gregg Thompson, Brisbane, Australia; Derek Wallentine, Albuquerque, N.M.; David D. Weier, Madison, Wis.; Douglas Wereb, Columbus, Ohio; John West, Bryan, Tex.; Bob Yajko, Leechburg, Pa.; Jim and Karen Young, Wrightwood, Calif.

OBSERVATIONS OF THE ANNULAR SOLAR ECLIPSE OF 1973, DECEMBER 24

By: Lawrence B. Nadeau, East Boston, Mass.

An expedition, largely from the University of Texas at Austin, successfully observed the annular solar eclipse of 1973, December 24 from a site at Puerto Escondido, Oaxaca, Mexico. The expedition consisted of David W. Dunham, Joan Bixby Dunham, Scott Killen, and Dwight West (University of Texas at Austin);

Figure 49. On the evening of August 2, 1975 Comet Kobayashi-Berger-Milon made an interesting configuration in the handle of the Great Dipper. For observers in the United States it lay just left of Mizar and Alcor, with its tail pointed upward from the horizon. Mr. John Sanford of the Orange County Astronomers in California started this 5-minute exposure at 5hrs., 10mins. on August 3, by U.T., using a 225-mm., f/1.65 Schmidt camera and 103a-O. At least one amateur "discovered" the intruding comet while observing the stars in the Great Dipper.

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Virginia Awe and Walter Awe (Weatherford, Texas); and Lawrence B. Nadeau (East Boston, Massachusetts). The following report is confined primarily to the personal observations of the last-named participant. The observing party set up near the outskirts of Puerto Escondido, next to the electrical power plant on the road to Oaxaca. The site was within a few yards of that used by the Japanese Hydrographic Office for the total solar eclipse of 1970, March 7, and was chosen so as to take advantage of the geodetic positions determined by the Japanese. Located at an altitude of about 300 feet and near the top of a bluff, this site offered a good view of the Pacific a mile or two to the south, though low-lying land a few miles to the southeast promised briefly to block the rising Sun.

As nearly polar opposite to the total solar eclipse of 1973, June 30, the annulus at the December 24th eclipse was unusually large. Overall ring size was further enhanced at our site (over that of most of the rest of the annular path) by our proximity to the sunrise terminator, so that the central eclipse magnitude of 90.6% was close to the smallest theoretically possible. Annular eclipses tend to be largely ignored on the assumption that few if any of the phenomena present at a total solar eclipse are visible. The extreme size of the annulus on December 24th made even more remote the possibility that such phenomena could be observed.

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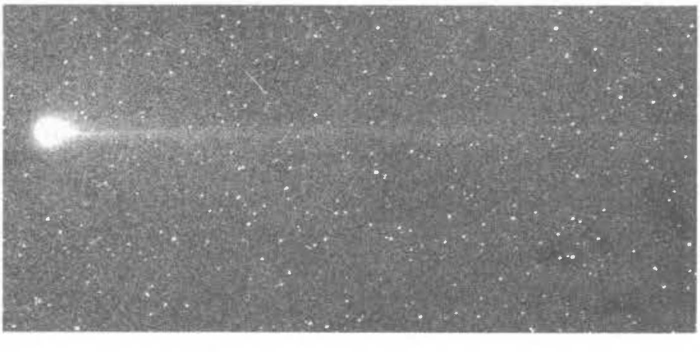

Figure 50. Photograph of Comet 1975h showing a gas tail 4 degrees long (3,700,000 miles). 15-minute exposure by Friedrich Seiler with an 8-inch Maksutov at München, West Germany on August 8.9, 1975, U.T. See also text on pp. 200-202.

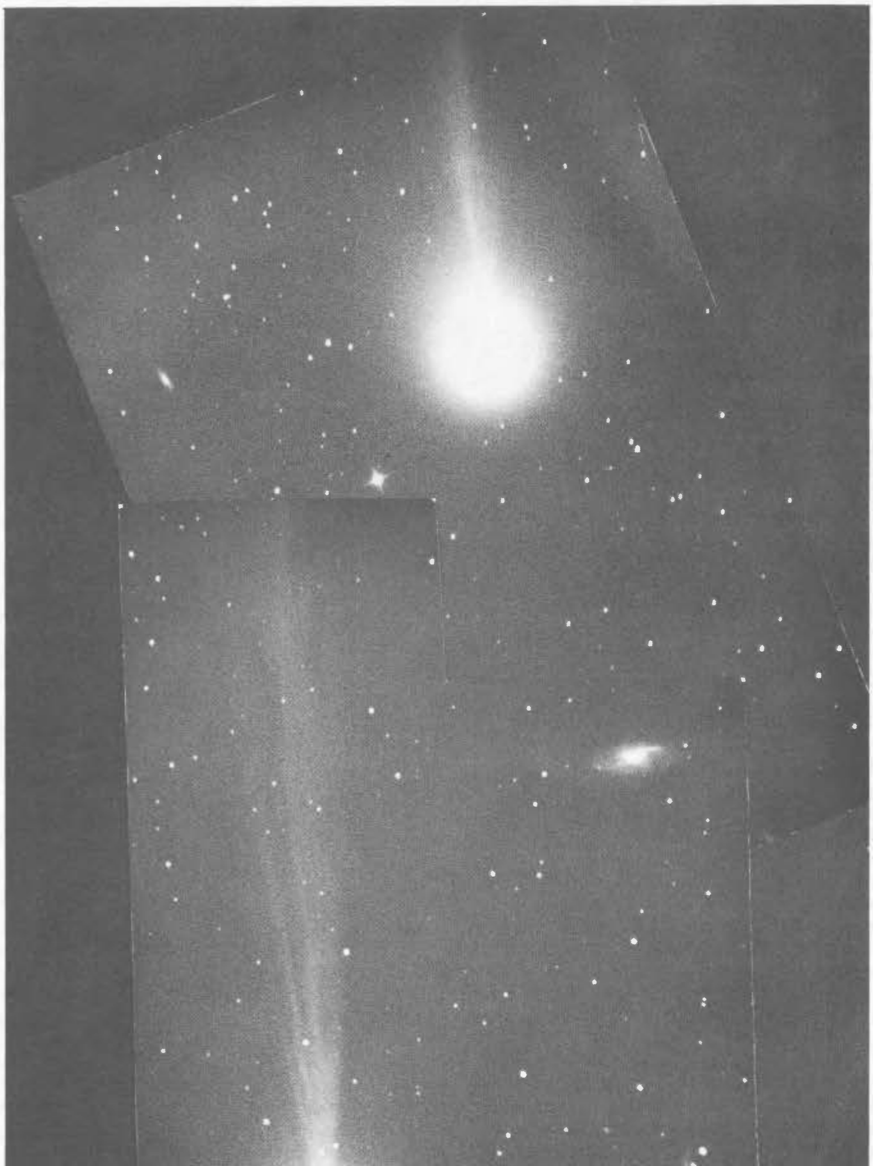

Figure 51. On August 10.23, 1975, U.T. (top) and August 11.25, Comet 1975h was near the spiral galaxy Messier 106 in Ursa Major, seen near the middle of this composite photograph. Each is a 30-minute exposure on 103a-F by John Laborde of Santee, Calif. with his 10-inch, f/5.6 Newtonian. The August 11 photograph clearly resolves four streamers in the gas tail. On this date M106 lay 50 minutes of arc northeast of the comet head. See also text of paper by Dennis Milon on pp. 200-202.

Figure 52. Photograph of Comet Kobayashi-Berger-Milon 1975h by John Laborde at Descanso, Calif. He began this 25-minute exposure on July 30, 1975 at 4hrs., 55mins., Universal Time. 10-inch f/5.6 reflector and 103 a-F film. There is a narrow gas tail one degree long.

* * * * * * * * * * * * * * * * * *

Indeed, the difference in size between the Sun and Moon was so great that there was even some question as to whether Baily's Beads would be seen at all --- let alone diminished in number. Yet at the same time the December 24th eclipse presented a good test: any totality phenomena observed (after discounting sunrise conditions) can surely then be seen at all other annular eclipses.

Aside from conditions peculiar to sunrise, one other influencing factor must be mentioned: our site was located more than half way from the central line to the northern limit, a necessary choice since the central line stayed a considerable distance off shore all along the Mexican coast. This fact somewhat shortened the duration of the annular phase, made the ring lopsided at maximum eclipse, and increased overall illumination by a minute amount (since the ring of Sun at maximum eclipse was not then confined solely to the Sun's limb-darkened edge). However, these negative factors were offset to a large extent by the greater duration that could be expected from Baily's Beads.

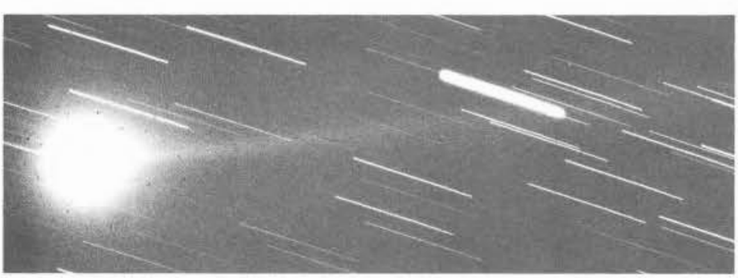

Figure 53. Photograph of Comet 1975h by Jim and Karen Young with a 6-inch f/10 refractor on 103 a-F film with a GG-14 filter. Taken on August 2, 1975, 4hrs., 15mins.-6hrs., 45mins., Universal Time. They guided on the comet's head for 2½ hours with a 24-inch Cassegrain. The stars are thus streaks.

* *

Transparency remained excellent during the entire period under discussion. The sky was clear blue with a slight amount of horizon haze. Little or no wind was in evidence, and the early morning horizon cumulus present at Acapùlco on the morning of the 23rd were here absent.

First contact took place at 12^h04^m U.T. with the Sun well below the horizon but with twilight in progress. Visually there appeared to be some leveling off in the intensity of twilight, beginning about half an hour before sunrise and continuing for about twenty minutes. Yet from about ten minutes before sunrise on there appeared to be no clear evidence, either from twilight, sky brightness (for which, of course, there would have been some eye adaptation), or sky color

Figure 54. Spectrum of Comet 1975h Kobayashi-Berger-Milon. The three bright emissions are the Swan bands at 4737, 5165, and 5635 angstroms (left to right). R. B. Minton made this composite from 8 exposures on August 1, 1975, 4^h19^m–4^h35^m, U.T., with an image tube attached to a 12-inch focal length f/3.5 Ektar lens.

* *

that an eclipse was in fact taking place.

Sunrise occurred at about 12^h54^m with the Sun some 70% eclipsed. Within a minute or two of that time the thin northern horn of the crescent could be seen lifting above the distant trees to the southeast. Throughout the eclipse visual inspection of the Sun was made using the unaided eye both with and without filters, and through a five-inch Celestron at about 60X and the finder scope attached to it, both with filters.

Observations with the unaided and unfiltered eye are of some interest. Within a minute or two of the time the Sun became visible it appeared to have lost most or all of its reddish hue and had become very difficult to look at. Irradiation was so great that the limb of the Moon could not be clearly defined. During the annular phase one could just make out that something was blocking the center of the Sun. Although the ring could not be clearly defined --- in particular on its inside edge --- irradiation created the impression that the Moon could not have been more than about half the diameter of the Sun! The probable explanation for this effect is that the eye, responding to overall illumination, was opened somewhat more than normal at a typical sunrise. This interpretation is given further support by the fact that overall illumination, including sky brightness and color, did not appear to be in any way diminished from normal in spite of the actual reduction of sunlight to only one-quarter of its true value for that time of day. It is also possible, of course, that the eye still retained a certain amount of dark adaptation from the night skies of an hour or so before sunrise.

The effects of irradiation on ring size were clearly brought home when filters were used with the unaided eye and with the finder scope. A light filter --- through which the Sun was still extremely bright --- made the ring about twice the width it actually was, though there was some improvement in the clarity of its outline both internally and externally.

Second contact was scheduled to occur at 13^h12^m, U.T., some eighteen minutes after sunrise. At maximum eclipse (13^h15^m) the Sun should have stood some 4° above the horizon. Third contact was predicted for 13^h17^m. At no time from sunrise through the annular phase did the Sun completely lose its oblate shape. This fact is clearly evident in the photographs taken by Joan Dunham (photographs and report in the March, 1974 issue of Sky and Telescope).

Filtered views through the five-inch Celestron revealed an enormous amount of boiling in the solar image --- more than had been expected by this observer even for so low a solar altitude, the assumption being made that early morning air would be relatively stable. The view towards the Sun was over both land and water; and while solar heating of the land so soon after sunrise should have been insignificant, the combined land/ocean air path may have created sufficient turbulence to intensify the effects of low altitude on the Sun's image. It is also probable that the five-inch diameter objective may have made the boiling more prominent. The boiling pattern tended to be both linear and parallel to the horizon, as well as in relatively sharp focus. As the horns of the encircling crescent advanced and thinned the boiling produced spurious black drop effects, so that Baily's Beads, if there were any, could not be seen with any certainty. The thin horns could be seen to advance perceptibly, but the atmospheric boiling and lack of contrast with the background sky made second contact impossible to time with any accuracy. By the time it was certain that the ring had become complete, second contact had already taken place.

Third contact proved much easier to observe, and Baily's Beads were seen; but their lack of contrast with a dark sky (such as would be the case at a total solar eclipse) detracted much from their grandeur. It seemed to this observer that a small strip of Sun remained briefly present between the horns after the ring had broken, but this seems not to have been noted on Dunham's photographs --- which do, however, verify improved conditions and better recognizable beads than at second contact.

After sunrise a very slight difference in the color of ground illumination was suspected, but could not be verified. The sky looked to be of normal color and brightness, probably because the eye was more opened in response to the three-quarter reduction in sunlight. A search was made from shortly after sunrise until after the annular phase for any evidence of the lunar shadow or the horizon glow. No evidence was expected, and none was forthcoming.

A search was made for Comet Kohoutek, some 10° to the southwest of the Sun, from before sunrise until shortly after the annular phase. Attempts were made with the naked eye and the five-inch before sunrise and with the naked eye after that. No trace of the comet was seen. A few attempts were also made to distinguish the Moon itself from the surrounding sky, with and without optical aid and filters. No difference was noted. A search was made for shadow bands, but none were seen. Neither was any alteration noted in the quality of shadows cast, though some alteration probably did take place. Particularly noted was a complete absence of what might be called psychological effects, though these are very noticeable in the late partial phase before totality with a total solar eclipse. A certain amount of excitement amongst observers was present, of course.

SOME SYSTEMATIC OBSERVATIONS OF SATURN DURING ITS 1973-74 APPARITION

By: Emilio Sassone Corsi, Paolo Sassone Corsi,
Antonio Fabozzi, and Giacomo Fuccillo, Neapolitan Astro-Amateur Group

The results ensuing from some visual and photographic observations of Saturn are here briefly expounded. These observations were carried out by over twenty Italian observers through varied astronomical instruments. It must be recalled that this apparition was particularly favorable thanks to Saturn's large angular dimensions, inclination of the rings, and large altitude above the horizon.

Visual Observations

Owing to the considerable Saturnicentric inclination, the rings hid the north hemisphere of the globe to within six degrees of the equator, letting only the southern hemisphere be seen.

S.P.R. (South Polar Region) - brown-grey, extraordinarily large and the darkest part of the globe.

S.S.T.B. (South South Temperate Belt) - readily visible as a wide band in close contact with the S.P.R.

S.T.B. (South Temperate Belt) - very thin, brownish-colored, visible only during the best conditions of seeing.

S.T.Z. (South Temperate Zone) - very wide and yellowish-colored, showing a few poorly defined brighter spots.

S.E.B. (South Equatorial Belt) - brown, divided into North and South components, and between them, there was a brighter zone (S.E.B. Zone).

E.Z. (Equatorial Zone) - the brightest zone of the globe, yellowish-colored, and within it the Equatorial Band could be seen during the best conditions of visibility.

Ring A - greenish-colored, appearing to consist of two parts separated by Encke's Division.

Cassini's Division - showing some irregularities, especially on its outer edge.

Ring B - very bright in its exterior part, not clearly defined at its interior boundary with Ring C.

Ring C - violaceous, seen only through telescopes of large aperture.

The shadow of the rings on the globe was visible as a thin dark feature through Ring C where crossing the globe.

The shadow of the globe on the rings showed the usual variations resulting from the changing geometry of the Sun-Earth-Saturn system.

In the following table the estimations of luminous intensity for the various features of the planet are reported on a scale where 0= the very brightest possible feature of the planet and 10= the background of the sky; between parentheses the number of the estimations is recorded:

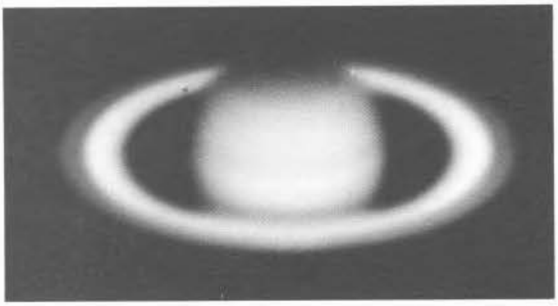

Figure 55. Photograph of Saturn with a 45-cm. reflector in S. Vittore's Observatory (equivalent focal length 40 meters) with Microfile Kodak film on December 11, 1973. See also text of article about Saturn by members of the Neapolitan Astro-Amateur Group.

Figures 55 and 56 are simply inverted views with south at the top. Note that the ball is brighter relative to the rings in infrared (Figure 56) than in visible light (Figure 55).

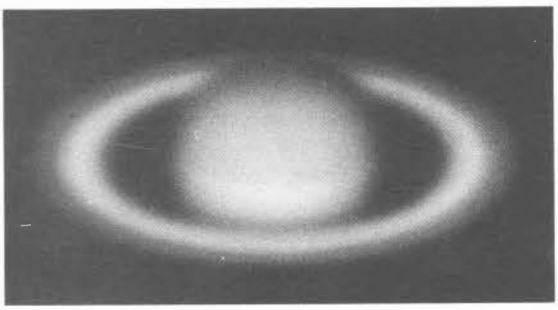

Figure 56. Photograph of Saturn with a 45-cm. reflector in S. Vittore's Observatory with High Speed Infrared film +RG5 on January 24, 1974. See also text.

Feature	Numerical Intensity
S.P.R.	5.2 (104)
S.S.T.B.	4.4 (15)
S.T.B.	3.4 (7)
S.T.Z.	2.1 (103)
$S.E.B._s$	4.0 (115)
$S.E.B._n$	4.2 (117)
E.Z.	1.1 (106)
S.E.B. Z.	2.0 (20)
E.B.	3.8 (4)
Ring A, outer part	3.6 (102)
Encke's Division	7.1 (36)
Ring A, inner part	3.5 (99)
Cassini's Division	8.5 (94)
Ring B, outer part	1.1 (114)
Ring B, inner part	2.3 (102)
Ring C	6.7 (64)
Ring C across Globe	5.4 (73)
Shadow Globe on Rings	8.7 (101)
Shadow Rings on Globe	6.5 (81)

Photographic Observations

All such observations were made with a 45-cm. reflector, prime focal ratio 1:5, at S. Vittore's Observatory (Bologna, Italy) having a focal length equivalent to 40 meters, giving an image of the major axis of the rings equal to 1 centimeter. More than 400 photographs were taken in the visible zone (by films RAR 2498 and Microfile Kodak, whose spectral sensitivity is 6400 Å) and in the red-infrared zone (by High Speed Infrared film and filter RG5, which transmits from 6700 Å to 9500 Å). To obtain greater sharpness, we adopted the technique of superimposition (from 4 to 6 images); the determination of the latitude of features was, by this expedient, made much more precise.

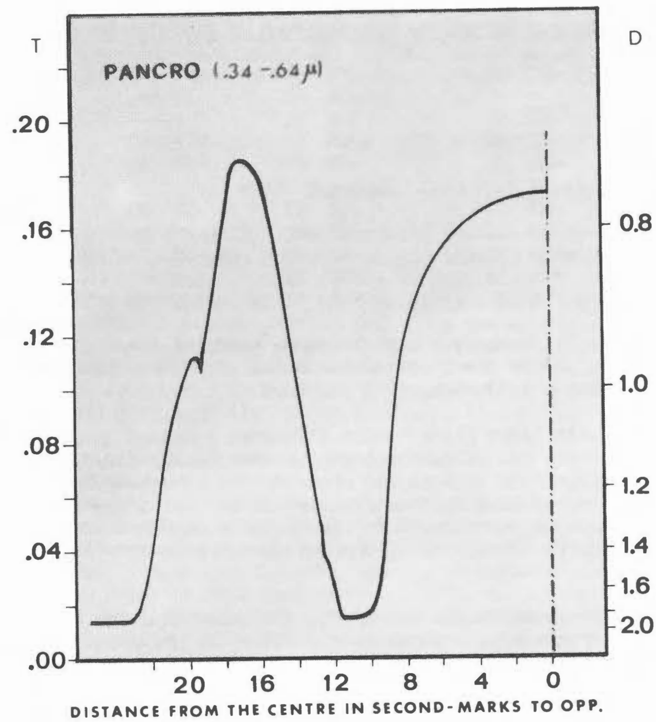

Figure 57. Photometric curve along the major axis of the rings of Saturn in panchromatic light (RAR 2498). Photometric intensity on vertical scale, distance from center of disc in seconds of arc on horizontal scale. See also text.

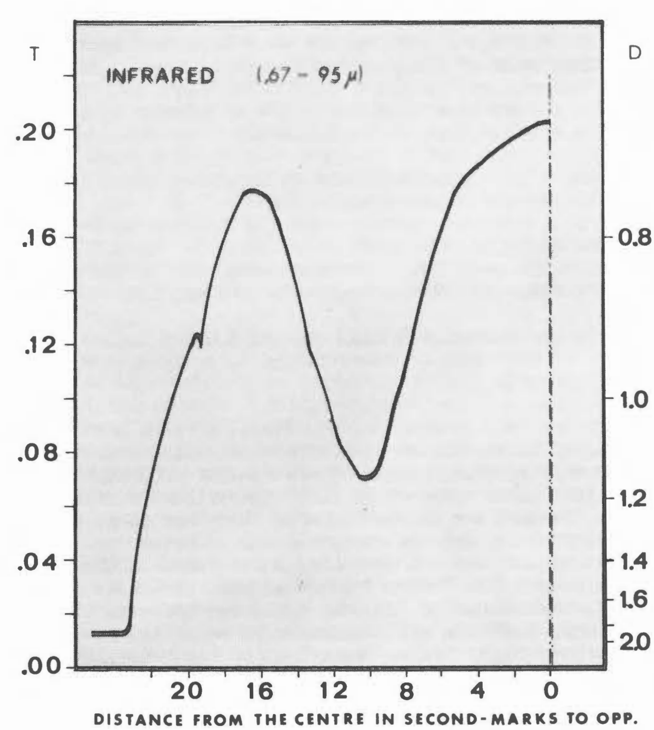

Figure 58. Photometric curve along the major axis of the rings of Saturn in infrared light (High Speed Infrared +RG5). Photometric intensity on vertical scale, distance from center of disc in seconds of arc on horizontal scale. See also text.

In the following table, the mean Saturnicentric latitudes calculated by astro-amateurs with different kinds of data are reported.

Feature	Visual Observation	Panchromatic Photographs	Infrared Photographs
Nedge S.P.R.	-66^{o} 54'	-67^{o} 46'	-65^{o} 56'
Sedge S.S.T.B.	----	-63 13	----
Nedge S.S.T.B.	-57 40	-54 01	----
center S.T.B.	-47 35	-38 14	----
Sedge $S.E.B._s$	-33 30	-30 45	-32 16
Nedge $S.E.B._s$	-29 43	-26 21	-25 00
Sedge $S.E.B._n$	-22 16	-19 18	-20 51
Nedge $S.E.B._n$	-15 27	-10 18	-12 11
center E.B.	+ 1 51	-00 17	----
Sedge Crape Band on globe*	+ 4 52	+ 6 42	+ 5 38

There are no considerable differences among the three kinds of data. It is only to be noted that the S.S.T.B. in the infrared was quite invisible; this phenomenon might be due to an intense reddish tint of the band.

The photographs secured with light filters with different luminous intensities gave characteristic calculated curves. These photographs were analyzed along the major and minor axes of the rings with a microphotometer at the Astronomy Institute of Bologna University. By means of some mathematical relations, which are skipped here for the sake of brevity, it is possible to determine the transmission of Saturn's various features (Figures 57 and 58). From the photometric curves certain relations are evident.

It is to be noted that the globe in the infrared is brighter than the rings, while it has nearly the same brightness in panchromatic light. In order to justify the difference in these two spectral zones, the following two hypotheses are offered:

(a) The globe is brighter in the infrared than in visible light.

(b) The rings are brighter in the visible region than in the infrared.

The hypothesis (a) allows two explanations:

(1) The globe is brighter in the infrared because of the high temperature of its surface.

(2) The globe is brighter in the infrared because of a different spectral absorption of the components of its atmosphere.

For the hypothesis (b) the explanation is unique: the components of the rings reflect more light in the visible than in the infrared.

Among the three hypotheses, (1) is considered the best, also because it has been confirmed, for Jupiter, by the new space researches.

Also, the zone between the rings and the globe is brighter in the infrared than is the background of the sky (Figure 58). This phenomenon may be due to a diffusion of the ring particles which lie in that zone (Rings C and D).

The Group of Neapolitan Astro-amateurs organize observations of Saturn every year. Whoever has an interest in this kind of observations is invited to write to: Mr. G. Fuccillo, Box 80, Napoli, Italy.

Postscript by Editor. We are much indebted to Mr. Fuccillo and his co-workers in Naples, Italy for the opportunity to publish this report on their observational studies of Saturn. We are especially glad for the opportunity to publish their report in the same issue as Julius Benton's report on ALPO observations of the same 1973-74 apparition of Saturn. Readers are invited to make their own comparisons. The two studies were quite independent, and the two groups of observers are completely distinct from each other. Perhaps the easiest comparisons are those of observed latitudes and numerical intensities. The Naples feature average intensities on page 208 can be compared with ALPO results on page 186; but since the two sets of observers used different intensity scales, it will be necessary to try to convert to some common scale. The Saturnicentric latitudes determined by the Neapolitan Astro-Amateur Group on page 210 may be compared to the "Planetocentric" column in Table II

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*This feature is not at a fixed latitude on the ball of Saturn but varies as the tilt of the rings varies.

on page 188. Finally, Mr. Vittore's two photographs on page 208 may be compared to ALPO drawings and photographs on pages 187, 188, and 190. It has been a major objective of the ALPO since its founding in 1947 to encourage coöperative international studies of the planets and the Moon among amateurs, and we congratulate the Neapolitan Astro-Amateur Group on their successful work.

OBSERVING MARS VI - THE 1975-76 APHELIC APPARITION

By: K. v. Knoepfel, ALPO Mars Section

Mars has an average 15.8-year seasonal opposition cycle, which consists of three consecutive perihelic oppositions and usually four aphelic ones. It is possible to observe Mars throughout two Martian seasons because of its unusually long apparition of approximately one terrestrial year. For the same reason, there is about one Martian season overlap and about one season advance between consecutive apparitions. See Fig. 59. The 1975-76 aphelic apparition is a seasonal transition period which allows observation of the southern summer yellow dust cloud epoch during pre-opposition (July to Oct., 1975) and the northern spring white cloud and whitening activity during post-opposition (Dec., 1975-June, 1976).

An apparition of a planet may be defined as the total duration of useful observability from Earth. For Mars, an apparition lasts about 12 months, less than half the 26-month interval between successive oppositions. This latter interval is also known as the synodic period. The next five Martian apparitions are considered aphelic because opposition occurs within 90° of aphelion, located at 70° L_S on the orbit. Refer to Fig. 59. During the aphelic apparitions Mars has a small maximum apparent disk diameter (17"-14"); but it is favorably placed high in the sky for telescopic study by northern observers, which improves the average "astronomical seeing." The north pole of Mars is tilted toward the Earth, and it is Martian spring and summer in the northern hemisphere. Not until 1984 will Mars again present as large an apparent disk diameter as at this current 1975-76 apparition.

1975-76 Apparition Characteristics

The 1975-76 Martian apparition is considered aphelic since opposition occurs on 15 December, 1975, only 72 heliocentric degrees before aphelion passage on May 21, 1976 (Fig. 59). The maximum apparent angular disk diameter occurs on 8-10 December, about 7 days before opposition. The diameter is 5" less than the maximum reached in 1973. Many important and influential observational characteristics occur around the period of opposition because of the orbital geometry between the Earth and Mars. Refer to the 1975-76 Graphic Ephemeris of Fig. 60 produced by C. Capen. During the period of maximum diameter the subearth (axial tilt) and subsolar points are coincident at 05°S. latitude on the Martian globe. This condition makes possible specular reflection observations of brightened (white patches) areas and improves local contrasts in nearby latitude regions. The equatorial regions of the planet are favored during most of the apparition, according to the tilt (dashed line) given in the Graphic Ephemeris. The apparent disk diameter for the apparition, represented by the solid curve, indicates that observation of Mars is practical from June, 1975 until late May, 1976. Quality photography is possible above 10 arcseconds from mid-September, 1975 to mid-February, 1976. Some relevant characteristics given in the Graphic Ephemeris are listed in Table III.

Observational Possibilities

Telescopic observations in different colors of light can now be interpreted with regard to the Mariner 9 topographic relief features as well as the classical light and dark albedo features. Observations in red vs. blue light will be most useful for the study of Martian yellow and blue-white clouds, blue-clearing, and surface changes during the aphelic 1975-76 apparition. This will be an epoch of Martian northern winter and spring. Blue-white clouds and surface whitenings should be most active during spring according to Tables I and II, and best seen in blue (W38A), green (W58), and magenta (W30) light. The recurrent orographic white clouds which form on the up-slopes of the volcanoes (Olympica, Ascraeus, Pavonis, Arsia Montes), Tharsis Ridge, and Elysium Shield need to be detected and studied. Mariner 9 spectroscopy has shown these clouds to be composed of water! The occurrence of the equatorial cloud bands and limb hazes is most important data. And, of course, any changes in the surface dark features, best seen in yellow (W15), orange (W23A), or red light (W25) is important data for the secular and seasonal history of Mars. Especially important to professional planetologists is information about the location and occurrence of yellow dust clouds in the northern hemisphere (yellow W15; red W25; or magenta W30). The Chryse, Isidis R., and Casius-Aetheria are suspected areas. There are undoubtedly others. We need desperately to locate these dust-pall active areas. See Fig. 61 for color filter transmission

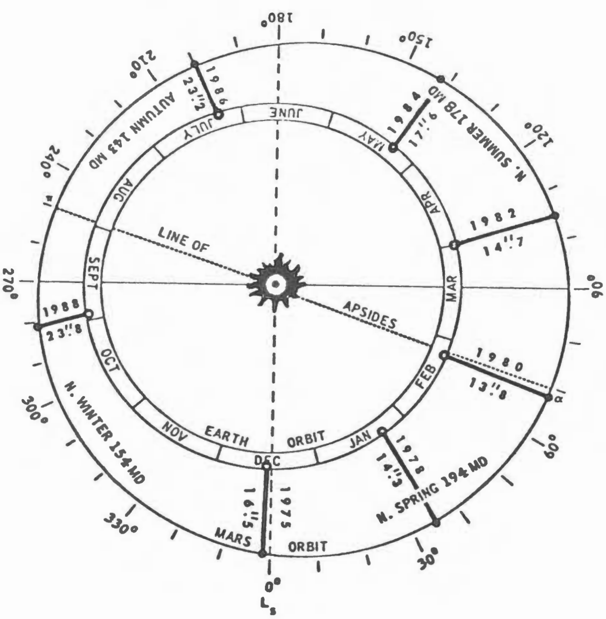

Figure 59. The oppositions of 1975-1988, the maximum apparent disk diameters for each apparition, and the relative seasons for Earth and Mars are shown on this heliocentric orbital chart. The Areocentric System L_S defines in degrees the Martian seasonal date, with 0 degrees the vernal equinox of the north hemisphere of Mars.

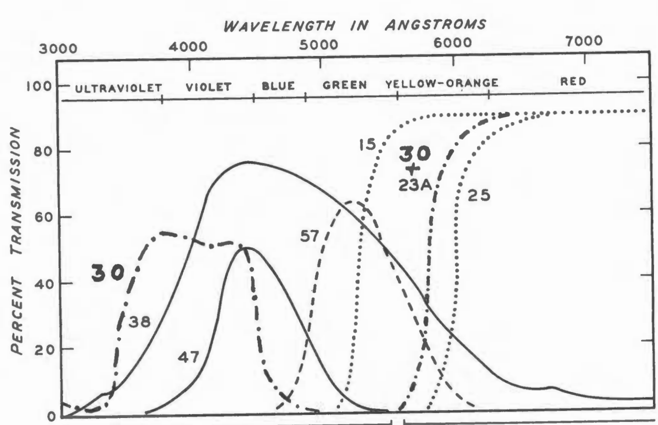

Figure 61. Wratten color filter spectral transmission curves widely used for planetary observation. The wavelength regions appropriate for specialized purposes are indicated by horizontal bars below the graph. The W30 filter (magenta in color) transmission appears in both violet-blue and orange-red regions as shown by the heavy dash-dot curve. The orange-red portion coincides with the W23A orange filter. Also see Ref. 1 for filter information.

curves. The north polar region will be favorably tilted for study, and the North Polar Cap retreat and peripheral arctic hazes can be monitored. Mariner 9 data have indicated that the North Polar Hood is composed of water clouds and that the South Polar Cap is probably a mixture of CO_2 and water crystals, as similarly proposed in a model for the NPC by C. Capen and V. W. Capen as early as 1965 (Ref. 2).

Table III. Martian Calendar of Events

1975, June 12 - Perihelion passage ($250^{o}L_S$). Dusty season begins in southern hemisphere. D_e=D_S at 23° S latitude.

July 14 - Solstice ($270^{o}L_S$). N. winter, S. summer. Look for bright yellow clouds and hazes from 270°-$335^{o}L_S$ in S. hemisphere. Maximum South Polar Cap retreat.

Sept. 1 - North Polar Hood large (300°). Color of bright A.M. limb?

Sept. 18 - Yellow cloud in Libya?; 275°W, 00° (310°-$315^{o}L_S$). Disk 10" diameter.

Oct. 15 - Disk 12" diameter. Begin high-resolution work.

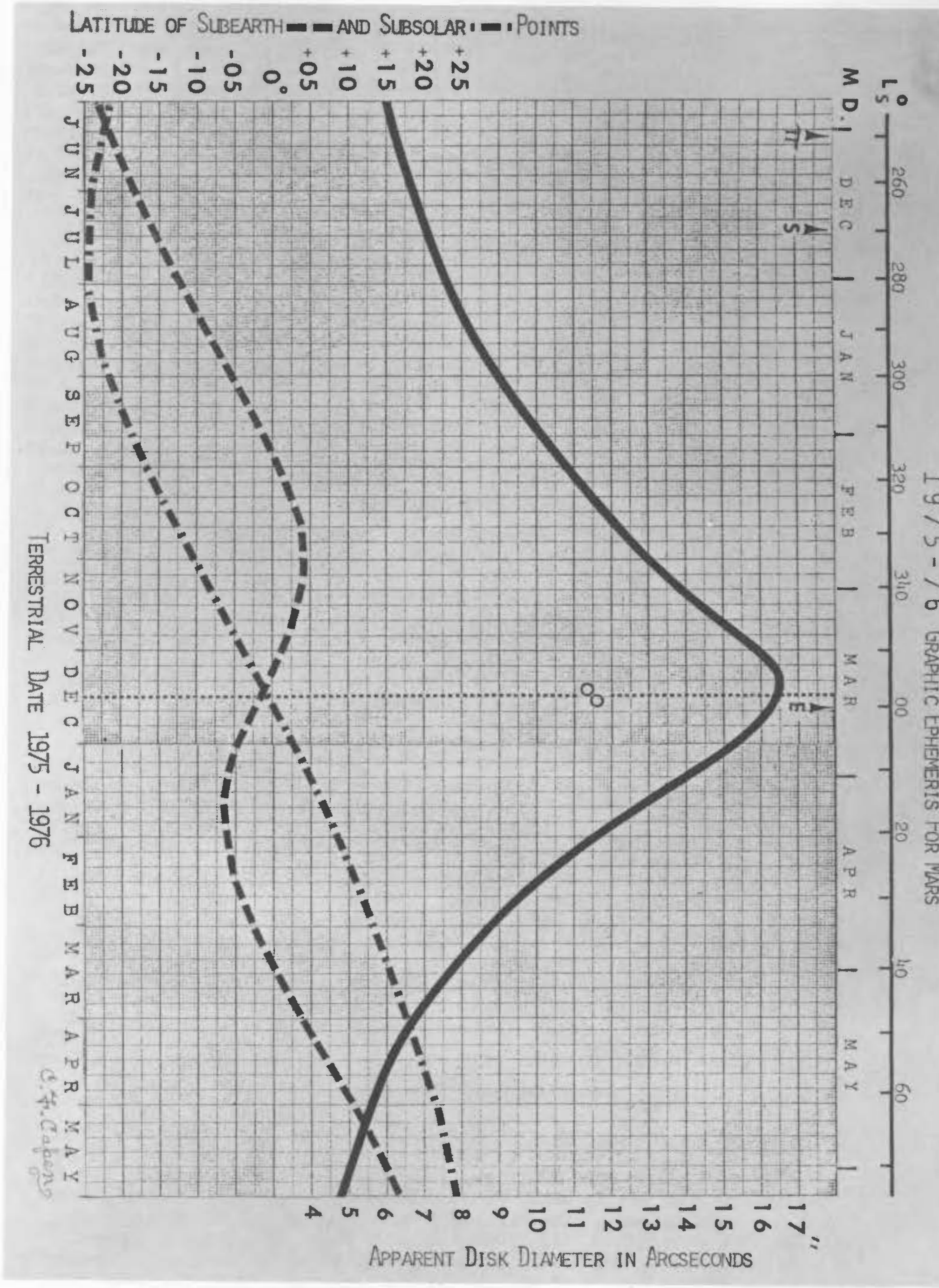

Figure 60. A 1975-76 Graphic Ephemeris for Mars shows the apparent disk diameter (solid curve) in arcseconds, the latitude of the subearth point (dashed curve) in areocentric degrees, and the latitude of the subsolar point (dash-dot curve) from June, 1975 to June, 1976. Figure by C. Capen. The Martian month and L_s are shown across the right edge of the graph.

* *

Dec. 8 - Closest approach. Max. 16".6 diameter.
Dec. 11 - D_e=D_s at 02°S latitude.
Dec. 15 - Opposition 16".4 diameter. 357°L_s.
Dec. 19 - Vernal equinox (00°L_s). N. spring, S. autumn. Look for disappearance

Table I. Seasonal meteorological activity, 1966-1970
(Capen and Capen, 1972)

	Spring L_S 0°-90° (%)	Summer L_S 90°-180° (%)	Autumn L_S 180°-270° (%)	Winter L_S 270°-360° (%)
Arctic	30.6	78.7	98.0	100.0
Antarctic	72.1	100.0	13.6	10.0*
Northern hemisphere	84.2	90.4	92.8	97.2
Southern hemisphere	50.9	87.5	30.1	80.6*
Morning	77.2	60.3	19.3	33.3
Afternoon	75.4	100.0	74.7	72.2
Cloud band	20.5	30.3	1.2	0.0*
Recurrent cloud (orogenic)	40.8	57.4	18.0	1.0*

*These percentages are probably more variable during this season due to the unpredictable nature and intensity of yellow storms.

Table II. Relative occurrence of seasonal cloud activity, 1966-1968
(between hemispheres and morning and afternoon).
(Capen and Capen, 1972)

	Spring L_S 0°-90° (%)	Summer L_S 90°-180° (%)	Autumn L_S 180°-270° (%)	Winter L_S 270°-360° (%)
Northern hemisphere	70.8	57.9	79.0	65.3
Southern hemisphere	29.2	42.1	21.0	34.7
Morning	48.2	40.7	19.2	32.6
Afternoon	51.8	59.3	80.8	67.4

Table III. Martian Calendar of Events, cont.

of NPH. Large NPC.

1976, Jan. 1 - NPC slowly vaporizing. Disk 15" diameter.

Jan. 26 - Disk 12" diameter. End of high-resolution work. Look for arctic hazes and bright patches.

Feb. 13 - Disk 10" diameter. Shrinkage of NPC noticeable. Look for blue-white clouds and white areas.

Mar. 13 - Axial tilt stays north ($+D_e$). Thawing of NPC increases. 40°L_S.

Mar. 25 - White cloud, white patches, and limb haze increasing in N. hemisphere. Disk 7" diameter.

May 21 - Observations become difficult at 5" diameter. Meteorological activity continues to increase.

June - NPC maximum thawing. Observation of clouds most needed (75°-85°L_S) in late spring.

Mars Observing Program

The ALPO Mars Section observing program is an international coöperative effort. Observing Mars from stations located around the Earth gives the advantage of a 24-hour surveillance of all Martian longitudes. The Mars Recorders coördinate and instruct coöperating observers in using similar observing techniques, colored filters, and methods of reporting data. The value of a set of synoptic (time-continuous) observational data is manyfold. It allows the daily study of any one of several Martian phenomena on a global basis, and it makes possible an "early-alert system" for observers of events located at any one Martian longitude. A Martian News Service (MC '75) is available from the Mars Recorder, 223 W. Silver Spruce, Flagstaff, Arizona, 86001, throughout an apparition for active observers. This service provides rapid notification of important observations as they are received from observers of Mars, observational aids, and an exchange of observational ideas. Active observers interested in receiving the Martian News send 8 to 10 self-addressed and stamped long envelopes to the Mars Recorder, C. F. Capen. When observational data have been copied on the standard ALPO observing forms they should be mailed at regular one or two month intervals. Reports of newly discovered changes or unusual Martian happenings should be sent immediately by air mail.

Observational data consist of visual drawings, visual photometry (intensity estimates on the de Vaucouleurs scale where 0=polar cap brightness, 2=desert mean brightness, 10=night sky), photography, and micrometry. Of most importance to the apparition analysis are photographs in red, green, and blue light, full disk drawings, and limited regional maps of selected areas of interest made from overlays on base maps. Related visual reports of polar region activity, atmospheric phenomena, whitened areas, and the appearance of surface features accompany drawings on the same form. The ALPO Mars kit contains a plain grid map of Mars which is used to indicate observed cloud and frost positions and to show surface feature changes. The new Mars Observing Kit contains useful reprints, observing techniques, graphs, charts, nomenclature, and information helpful for the next four aphelic apparitions. It is available at cost postpaid for $3.50. Standard ALPO Mars observing report forms are 20 for $1.75. Add $0.50 overseas postage. These items may be obtained from the ALPO Mars Recorder.

According to recent correspondence, some observers have questioned the value of telescopic observations in light of the highly successful TV results of Mariner 9 in 1971-72. This apathy toward new Earth-acquired Mars data, if pursued, could cause the loss of valuable observational information about Martian seasonal phenomena. The Mariner 9 orbiter was only able to acquire data for less than half a Martian year (168^{o} of L_S), beginning in early Martian N. winter at 291$^{o}L_S$ and terminating in N. summer at 99$^{o}L_S$. It is with pride for us to compare this $1,000,000X N project to the seasonal coverage (L_S) obtained by the ALPO Mars Observational Programs for 1969, 1971, and 1973 (Refs. 3, 4, 5). The surface and atmosphere were obscured by Capen's Great Dust Storm during part of this Mariner 9 period. High-resolution information from north of the 30^{o} parallel of latitude was poor, and elevation relief data is still confused. Nevertheless, topographic relief maps of Mars equivalent to the best telescopic resolution of the Moon are now available as reference tools. The telescopic observer can still provide very useful information to the professional study and understanding of Martian weather, seasonal phenomena, and surface conditions. Large scale telescopic colorimetry data can be interpreted relative to the fine-scale Mariner 9 topo-relief features and environmental spectroscopic data. The professional planetary observing programs have recently been seriously cut back due to lack of government funds. Consequently, the contributions from the amateur astronomer are needed today to fill in data gaps which can occur during the 1975-76 and 1977-78 Mars apparitions. Observational information obtained during this period will be most important to Man's greatest undertaking - the search for life on Mars by Viking's Prospector.

For an excellent summary of the Mariner 9 results, obtain a copy of THE NEW MARS, by Wm. K. Hartmann and O. Roper, NASA SP-337 for $8.75 from Superintendent of Documents, US Gov't. Printing Office, Washington, D. C. 20402. This is a lavishly produced and accurate volume authored by one of our own ALPO Mars Section Observers. The Mariner data and the new USGS Atlas of Mars (Refs. 6 and 7) make our telescopic observations of the Red Planet even more interesting and meaningful.

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ANNOUNCEMENTS

Proceedings of WAA-ALPO 1975 Convention. These are now being prepared and can be purchased from Mr. Doug Berger, 4312 Agena Circle, Union City, CA 94587. The price is $6.50. In the Proceedings papers given at the meeting can be reread and studied in detail, and it will certainly be an attractive and useful booklet for reference.

New Addresses for Messrs. Benton and Olivarez. The address of our Saturn and Venus Recorder is now as follows: Dr. Julius L. Benton, Jr., Director, Thornwell Museum, P. O. Box 60, Clinton, South Carolina 29325. The head of the Lunar and Planetary Training Program now has this address: Jose Olivarez, Dept. of Community Facilities, 225 W. Douglas, Wichita, Kansas 67202. A new planetarium is to be designed and built at Wichita this year, and Mr. Olivarez will be the director when it is completed in 1976. Both changes in address are already effective.

<u>1976 ALPO Convention</u>. Next year the ALPO will hold its meeting with the Astronomical League National Convention at Kutztown State College, located between Allentown and Reading, Penna. The time will be the week of August 15-22, 1976. More details will appear in our future issues as the event draws closer, but we might mention now that the theme will be "Two Hundred Years of Amateur Astronomy." There will be special bus tours to Philadelphia, Valley Forge, Hopewell Village, and other historic places in the vicinity.

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