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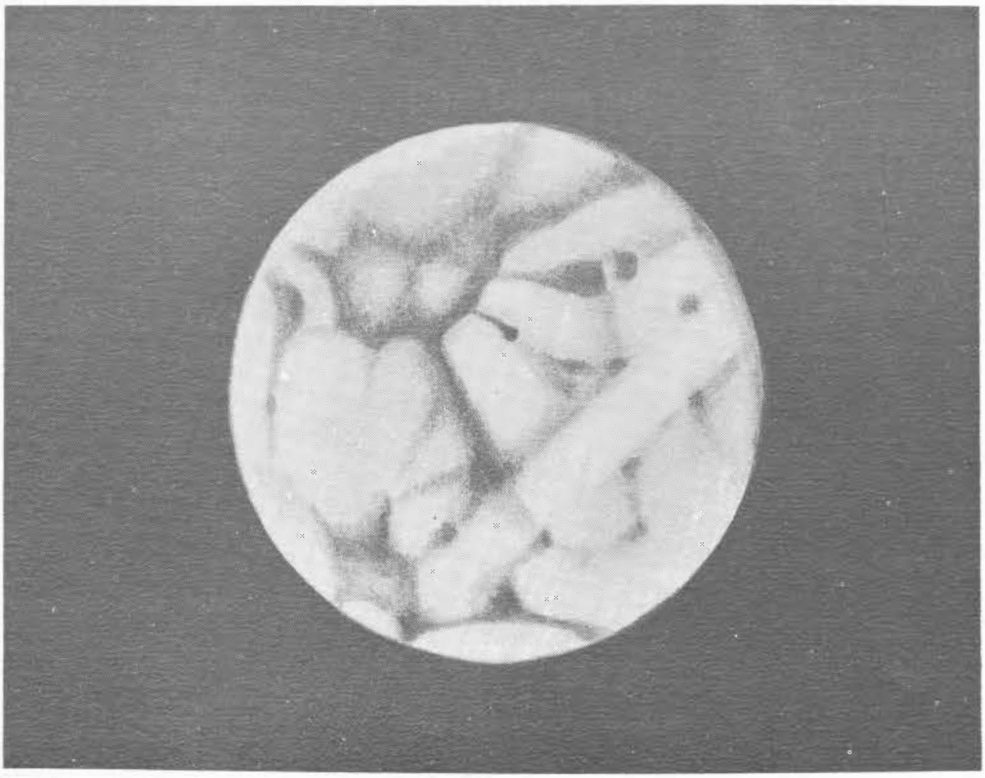

Drawing of Mars by Ernst E. Both on January 20, 1961, at 23 hrs., 40 mins., Universal Time. 8-inch refractor at 375X to 500X. Seeing 7 (good), transparency 5 (extremely clear). C.M.=76°. Diameter 13".7, tilt to earth 0°.9 south, heliocentric longitude of Mars 109°. Note Solis Sacus, Mare Erythreum, Mare Acidalium, and strong development of Lunae Lacus-Ganges.

THE STROLLING ASTRONOMER

Pan American College
Observatory
Edinburg, Texas

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SOME HIGHLIGHTS OF THE 1960 JUPITER APPARITION

By: Philip R. Glaser

A.L.P.O. members may rightfully feel proud of their observational work during the 1959-1960 apparition of Jupiter. Seldom has the planet been so well observed while at the same time being so poorly placed for observation by the majority of workers. In spite of the fact that Jupiter was in low south declination during the entire apparition (minus 23° 07' 03" on June 20, 1960, the date of opposition) a record number of 60 A.L.P.O. members have thus far contributed transit observations, drawings, conspicuousness-intensity-color estimates, photographs, latitude measures, and other data. Further, observations were made much closer to the conjunction dates of December 6, 1959, and January 5, 1961, than has usually been the case: the earliest observation of December 29, 1959, was reported by Mr. Tom C. Constanten, and the latest of December 25, 1960, by Mr. Walter Haas. Mr. Carlos E. Rost, observing from Santurce, Puerto Rico; Dr. E. C. Melville, from Kingston, Jamaica; and Mr. Haas from Edinburg, Texas, are also due special thanks for the skilled manner in which they used the favorable locations of their stations to obtain particularly valuable observations. Larger than usual apertures were also used to fine advantage, particularly by Mr. Clark Chapman and Mr. Paul Knauth, who had the opportunity to use Professor Paul Engle's 17-inch reflector while attending the Summer Institute in the Astro-Sciences directed by Professor Engle during June and July, 1960, at Pan American College.

Adequately to deal with these and the many other outstanding observations reported will, of course, require much study; and in later reports Mr. Reese and the present writer will attempt to organize and make meaningful the quantitative results obtained. In the meantime, however, it is hoped that the following general description of particularly interesting Jovian phenomena which were observed and drawn by A.L.P.O. members during the apparition will be considered instructive. Readers are invited to study Figures 1 to 37, which illustrate many of the points of the following short description.

Return of the Red Spot. As is usually the case early in a Jupiter apparition, the aspect presented by the Red Spot area drew the particular attention of observers during the first few months of 1960. It will be recalled that during most of 1959 the Red Spot was not seen as a dusky marking at all, but rather exhibited its faded aspect, with only the "Hollow" in the South Tropical Zone marking its location. Early observations in February, 1960, by Haas and Chapman indicate that the aspect was still that of the "Hollow" at that time. However, as soon as the planet's position allowed satisfactorily long and fine views, it became evident that 1960 was going to feature a return to visibility of the Spot itself. Haas saw it much darkened on March 19; Reese drew it as a full dusky oval on April 13; Chapman noted on May 19 that "What now seems to be the RS (not prec. shoulder of RSH) was quite prominent..."; and Dr. Bartlett on June 2 found it to be quite dark and easily seen. Thereafter, a majority of the observers saw it as a delicately-dusky oval. It should be noted, however, that observers using 10 inches or more of aperture, as well as others during moments of particularly fine "seeing", frequently saw the interior of the oval as non-uniformly shaded, or even rather complexly structured.

South Tropical Zone Brightens. Another striking change in the general appearance of Jupiter which was noted immediately in 1960 by all careful observers was the extreme brilliance of the South Tropical Zone, which had been very dusky and somewhat reddish in color before the conjunction of December 6, 1959. The impression was unavoidable (though completely unsupported by any evidence known to this writer) that the dark material previously distributed throughout the STrZ was now concentrating in some mysterious manner to form the dusky Red Spot. Perhaps one may have felt that the south component of the South Equatorial Belt was also contributing to this change, since it remained just as narrow and ill-defined as it had been in 1959 despite the brightening of the adjacent STrZ.

SEB$_s$ Spot #2. Observers were hardly accustomed to these major changes in Jupiter's appearance, when they were alerted to the presence of yet another potentially very important feature visible in the planet's southern hemisphere: a dark spot or condensation on the north edge of the SEB$_s$, at System II longitude (May 28) of 247°.5. It was first observed by Tompkins on May 21, then by Haas on May 28, and on June 2 by Reese, who, feeling that the spot might signal the imminence of a new major SEB Disturbance, immediately requested special observational effort. Splendid cooperation was given and it was soon established by a series of fine transit timings that the spot was quite stationary in longitude instead of moving rapidly, as would be considered typical if this spot were closely to precede the outbreak of a Major S.E.B. Disturbance. The feature, now designated "SEB$_s$ Spot #2" remains of much interest, however, since it seems quite impossible on the basis of presently known observations either to confirm or to disprove that it is identical with a similar spot (SEB$_s$ Spot #1) observed in the same latitude during 1959 (Str. A., Vol. 14, p. 76). This interesting question may never be answered unless additional evidence is brought to light, and all observers are urged to search their records carefully for unreported late 1959 and early 1960 sightings of the SEB$_s$ Spot(s).

Red Spot Festoon. The next surprise in store for the 1960 Jupiter observer was the appearance of an unusual festoon or column connecting the north edge of the Red Spot with the SEB$_n$. It was first reported by Bartlett on June 27 and for many weeks went quite unconfirmed. Later reports, however, show that the feature was seen by Mr. Gary Wegner on June 24 with a 10-inch reflector, by Chapman on July 11 with a 17-inch reflector, and by Mr. Patrick McIntosh on July 28 with a 4-inch refractor. Ordinarily, the lack of additional observations might leave some doubt as to the reality of the feature; but this writer considers the fact that both large and small apertures were employed by observers of known skill and experience to be very compelling reasons to count the festoon as real. Further, a very interesting interpretation has been suggested by Reese in connection with this festoon: in a letter of September 1, 1960, to this writer, he says "...it seems that the Red Spot and the extrapolated drift of the SEB$_s$ Spot #1 would have been in conjunction near the time of the festoon sightings. There doesn't seem to be nearly enough evidence, however, to justify the identification of the festoon with Spot #1. It remains a possibility."

Mid-Apparition and the STeZ Bright Ovals. On June 20 came opposition, with Jupiter at its highest altitude during the evening hours, comfortable observing weather, and the "vacation season"--all simultaneously. Such a fortuitous set of circumstances, of course, increased many-fold the number of observations reported; and, particularly during July and August, some unusually fine work was done. Your Recorders wish particularly to thank talented new A.L.P.O. observers such as Mr. Tom Joldersma and Mr. Jim Fortenberry and all others who so conscientiously and effectively heeded the request to concentrate their efforts on the making of Central Meridian Transit Observations. As a result, the quantitative information of true value obtained was gratifyingly large; and it is expected that the 1960 "drift charts", when completed, will on this account be particularly well-documented. Perhaps of special interest during the "peak" observing season were the Long Enduring Bright Ovals, FA, BC, and DE, which were again much in evidence in the northern part of the South Temperate Zone. One of these, BC, presented a most interesting spectacle as it approached the Red Spot during August--the Red Spot very slowly increasing in longitude (II) and BC drifting toward it in the opposite direction. Their centers appear to have been in conjunction on September 4, near System II longitude 348°.

The NTrZ Gets Brighter. After October 1, Jupiter rapidly became unsuitable as an object for useful study by most observers. As has already been mentioned, however, a few observers whose stations are located in low northern latitudes and a few others who took advantage of every moment of even fair "seeing", continued to make the all-important Transit Observations and to stay alert for any changes in the planet's appearance. They were rewarded with what at this time appears to be one of the final major changes of the 1960 apparition: a conspicuous brightening of the North Tropical Zone. This was reported as "strongly suspected" during October

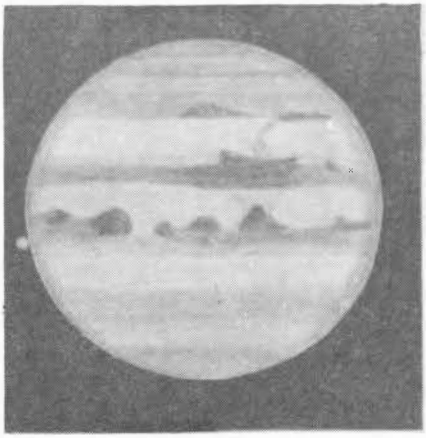


FIGURE 1. Jupiter.
Clark R. Chapman. 10-in. refl.
February 24, 1960. $11^h\ 35^m$ U. T.
C.M. I=140°. C.M. II=299°.
Note light aspect of RS & Satellite I at prec. limb.

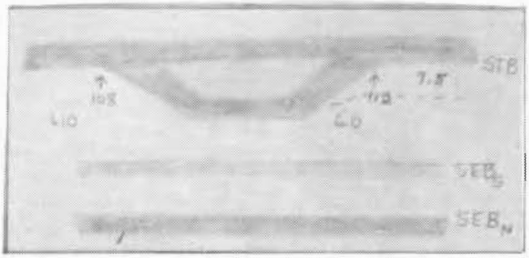


FIGURE 2. Jupiter.
Walter H. Haas. 12.5-in. refl.
March 19, 1960. 12^h - $12^h\ 40^m$ U. T.
C.M. II=320° to 344°.
Composite sketch of darkened RS.
Also note Intensity-numbers and transit-numbers.

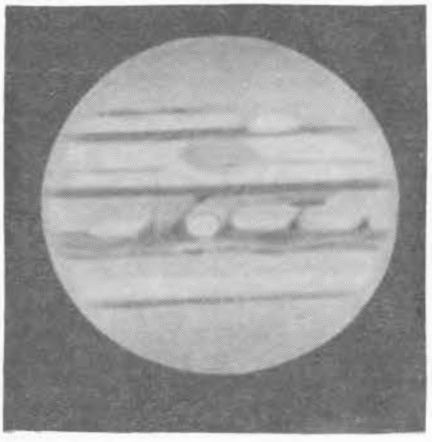


FIGURE 3. Jupiter.
Elmer J. Reese. 6-in. refl.
April 13, 1960. $8^h\ 15^m$ U.T.
C.M. I=195°. C.M. II=341°.
Note dusky RS & bright oval FA.

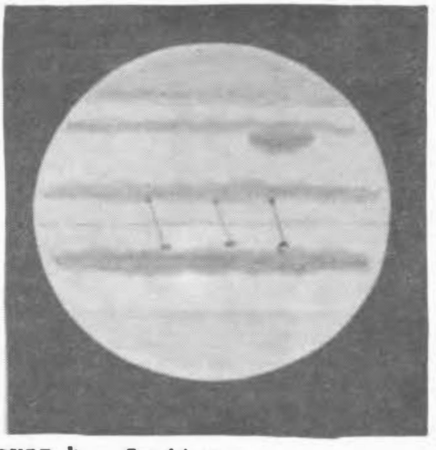


FIGURE 4. Jupiter.
James C. Bartlett, Jr.
4.25-inch refl.
June 5, 1960. $6^h\ 29^m$ U. T.
C.M. I= 224°. C.M. II= 327°.

FIGURE 5. Jupiter. Philip R. Glaser.
8-in. refl. June 8, 1960. 5^h U. T.
C.M. I=284°. C.M. II=4°.

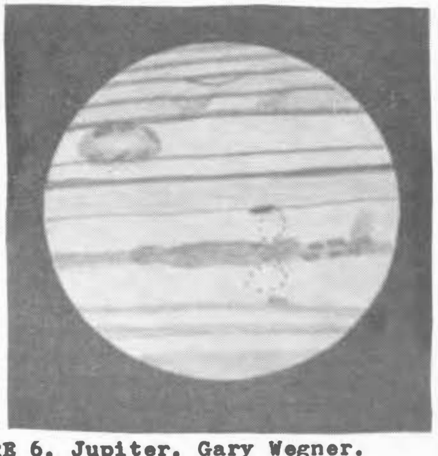


FIGURE 6. Jupiter. Gary Wegner.
10-in. refl. June 22, 1960. $6^h\ 59^m$
U.T. CM I=50°. CM II=22°. Note RS
with shaded interior.

by Knauth and Chapman and is now well established by a recently submitted report by Haas, who shows the relative intensity of this zone to have increased from a value of 5.5 on September 12 to 7.5 on October 30, or 0.5 units greater than the previously superior STrZ.

The writer regrets that the time available for preparing this interim report and the space available for its publication do not permit the detailed discussion of all the fine Jupiter work contributed during 1960 by so many fine observers whose names have not specifically been mentioned. He is certain, however, that the obviously superb quality of so many of the appended drawings (Figures 1 to 37) will not go unnoticed; and in closing he wishes to extend his personal thanks and congratulations to each of the observers listed below:

Observer	Telescope(s)	Station
W. F. Barber	6" refl., 2."4 refr.	Atlanta, Ga.
James C. Bartlett, Jr.	5" refl.	Baltimore, Md.
Gil Bisjak, Jr.	6" refl.	Chino Valley, Ariz.
Klaus R. Brasch	8" refl.	Montreal, Quebec, Canada
Phillip W. Budine	4", 2."4 refrs.	Binghamton, N. Y.
Arthur Burns	6" refl.	Barrington, N. J.
Clark R. Chapman	17", 10" refls.	Buffalo, N. Y.
Tom C. Constanten	17", 12."5 refls. 3."25 refr.	Las Vegas, Nev.
Dale P. Cruikshank	40" Yerkes refr.	Des Moines, Ia.
John Cooper	4" refl.	Edmonds, Wash.
Charles M. Cyrus	10" refl.	Baltimore, Md.
Bob Danford	12" refl.	Tulsa, Okla.
René Doucet	5" refr.	Cap de la Madeleine, Quebec, Canada
Stanley Emig	8" refl.	Leavenworth, Wash.
Stuart Emig	8" refl.	Leavenworth, Wash.
Eugene Epstein	10" refl.	Hollywood, Calif.
Karl Erhardt	6" refl.	Queens Village, N. Y.
Jim Fortenberry	10" refl.	San Diego, Calif.
Geoffrey Gaherty, Jr.	8" refl.	Montreal, Quebec, Canada
Gary George	2."4 refr.	Binghamton, N. Y.
Henry Gomez	16", 6" refls.	Eagle Pass, Texas
Walter H. Haas	12."5, 6", 17" refls.	Edinburg, Texas
William K. Hartmann	13" refr., 8" refl.	New Kensington, Pa.
Alika K. Herring	12."5 refl.	Anaheim, Calif.
Jack Hills	8" refl.	Independence, Kan.
Craig L. Johnson	4" refl.	Boulder, Colo.
Lyle T. Johnson	16" refl.	Welcome, Md.
Tom Joldersma	8" refl.	Holland, Mich.
Walter Kaminski	13" refl., 3" refr.	Milwaukee, Wis.
Paul Knauth	17", 10", 6" refls.	Houston, Texas
Jim Low	4" refl.	St. Lambert, Quebec, Canada
Rich Luecke	6" refl.	Chicago Heights, Ill.
Virginia D. Lyle	4" refr.	Pittsburgh, Pa.
E. C. Melville	10" refl.	Kingston, Jamaica
Dennis Milon	8" refl.	Houston, Texas
Mary Churns McConnell	6" refl.	New York, N. Y.
Patrick S. McIntosh	4" refr.	Sunspot, N. M.
J. E. Newman	6" refr.	Roanoke, Va.
José Olivarez	2."4 refr.	Mission, Texas
Tom Osypowski	13" refl.	West Allis, Wis.
Robert R. Provine	8" refl.	Tulsa, Okla.
Owen C. Ranck	4" refr.	Milton, Pa.
Elmer J. Reese	6" refl.	Uniontown, Pa.
Charles L. Ricker	6" refl.	Albuquerque, N. M.
Carlos E. Rost	6" refl.	Santurce, Puerto Rico
Takeshi Sato	6" refl.	Hiroshima, Japan
J. Russell Smith	16" refl.	Eagle Pass, Texas
Elizabeth Socha	8" refl.	Brooklyn, N. Y.
James Starbird	6" refl.	Topeka, Kan.

(continued on Page 46)

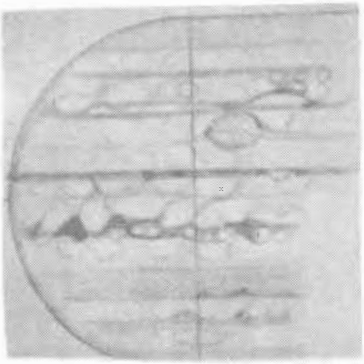


FIGURE 7. Jupiter. Clark R. Chapman. 17-in. refl. July 11, 1960. $6^h\ 15^m$ to $6^h\ 56^m$ U. T. C.M. I=147°. C.M. II=335°. ($6^h\ 20^m$ U. T.) Note RS interior detail & other activity revealed by large aperture.

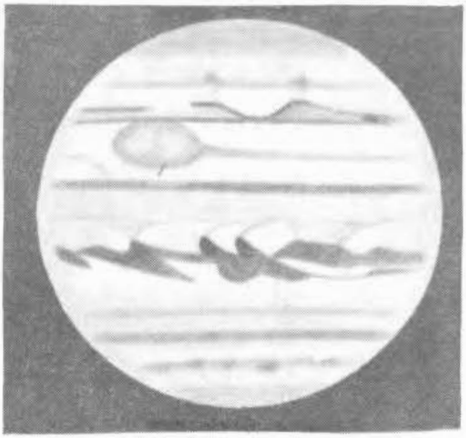


FIGURE 8. Jupiter. Takeshi Sato. 6-in. refl. July 17, 1960. $12^h\ 15^m$ U.T. C.M. I=232°. C.M. II=12°. Note shaded RS & STeZ oval BC.

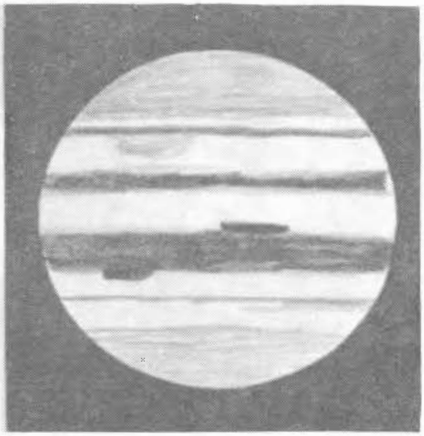


FIGURE 9. Jupiter. Joseph Sullivan. 3-in. refr. July 22, 1960. 1^h U.T. C.M. I=250°. C.M. II=355°.

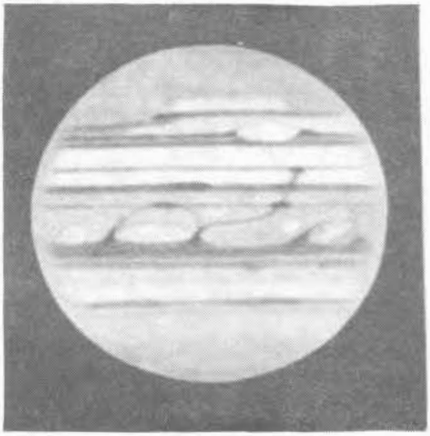


FIGURE 10. Jupiter. Elmer J. Reese. 6-in. refl. June 2, 1960. 6^h U.T. C.M. I=93°. C.M. II=218°. Second drawing of SEB_s Spot 2. Also note STeZ oval DE.

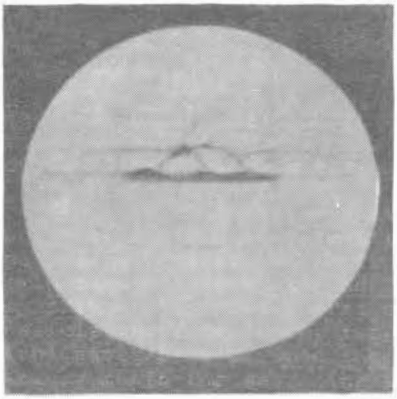


FIGURE 11. Jupiter. Clark R. Chapman. 17-in. refl. June 17, 1960. $4^h\ 20^m$ U.T. C.M. II=253°. Detail of festoon activity associated with SEB_s Spot 2.

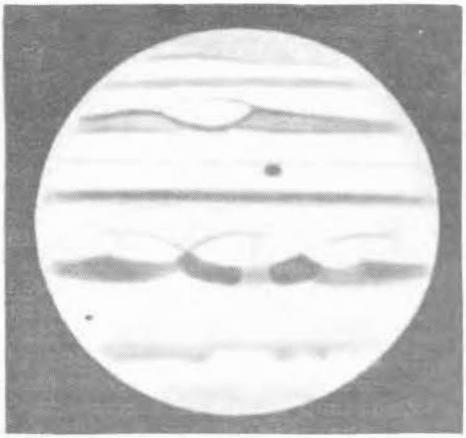
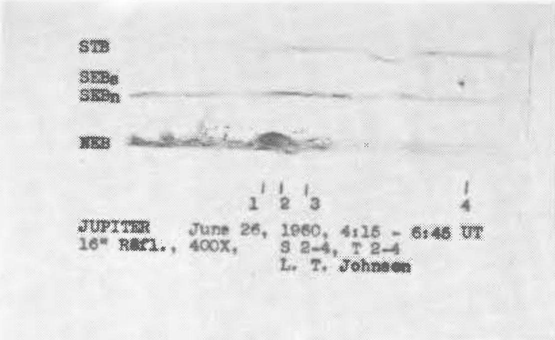


FIGURE 12. Jupiter. Takeshi Sato. 6-in. refl. June 17, 1960. $13^h\ 50^m$ U.T. C.M. I=230°. C.M. II=238°. SEB_s Spot 2 and STeZ oval DE.



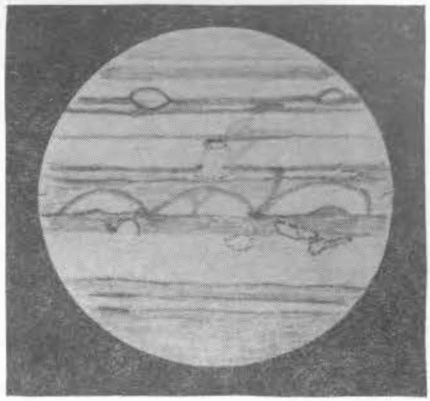
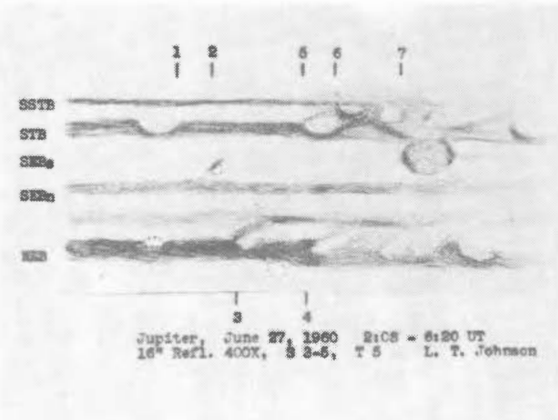


FIGURE 13. Jupiter. Paul Knauth. 17-in. refl. June 21, 1960. 7^h 22^m U.T. C.M. I=265°. C.M.II=245°. SEB$_s$ Spot 2 near C.M. preceded in STeZ by DE & followed by FA.



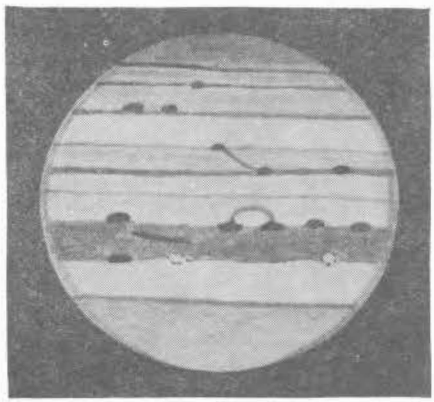


FIGURE 14. Jupiter. Phillip W. Budine. 4-in. refr. June 27, 1960. 2^h 21^m U.T. C.M. I=310°. C.M. II=245°. SEB$_s$ Spot 2 and festoon.

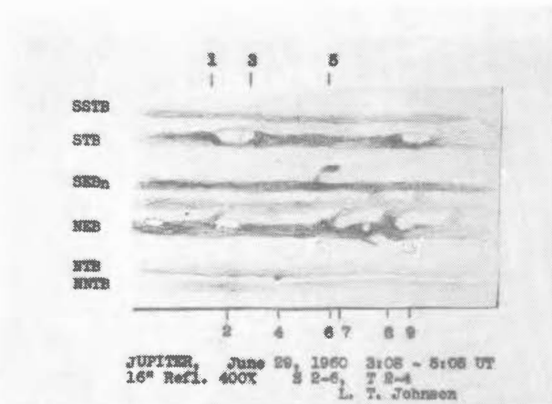


FIGURE 15. Jupiter.
These strip sketches by Lyle T. Johson may indicate rapid changes in the appearance of SEB$_s$ Spot 2.

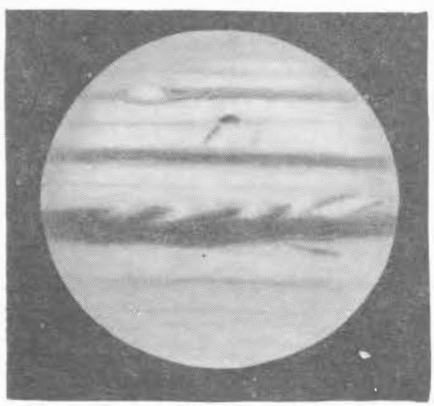


FIGURE 16. Jupiter. Philip R. Glaser. 8-in. refl. July 4, 1960. 3^h 9^m U.T. C.M. I=5°. C.M. II=247°. SEB$_s$ Spot 2 on C.M.

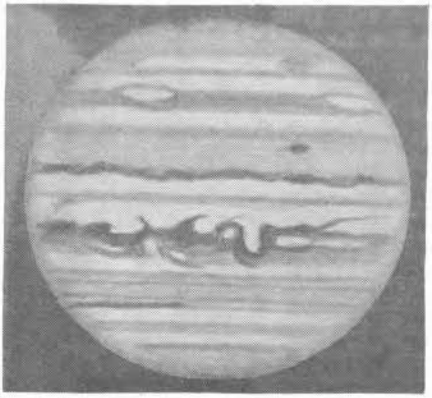


FIGURE 17. Jupiter. Alika K. Herring. 12.5-in. refl. July 30, 1960. 3^h 59^m U.T. C.M. I=183°. C.M. II=226°. DE, SEB_s Spot 2, and FA.

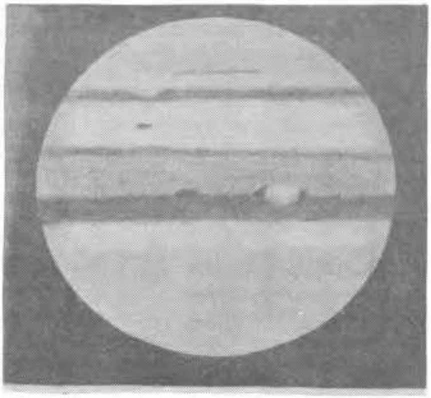


FIGURE 18. Jupiter. Tom Joldersma. 8-in. refl. August 26, 1960. 2^h 17^m U.T. C.M. I=62°. C.M. II=260°. SEB_s Spot 2 & FA.

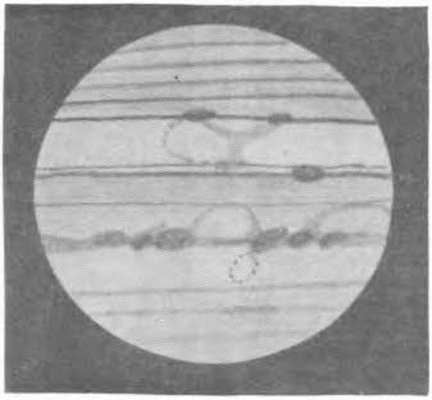


FIGURE 19. Jupiter. Gary Wegner. 10-in. refl. June 24, 1960. 7^h 35^m U.T. C.M. I=27°. C.M. II=344°. Note RS festoon.

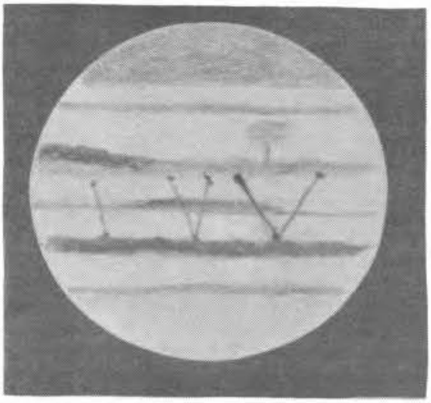


FIGURE 20. Jupiter. James C. Bartlett, Jr. 5-in. refl. June 27, 1960. 4^h 33^m U.T. C.M. I=30°. C.M. II=325°. RS festoon.

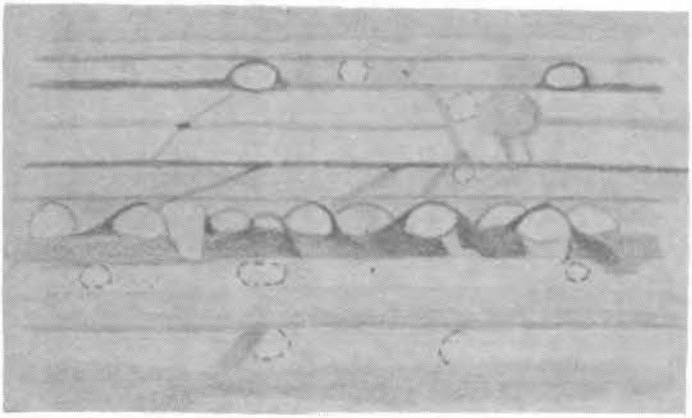


FIGURE 21. Jupiter. Patrick McIntosh. 4-in. refr. July 28, 1960. 3^h 13^m - 5^h 59^m U.T. C.M. I=198° to 300°. C.M. II=257° to 358°. Note SEB_s Spot 2, FA, BC, & RS festoon.

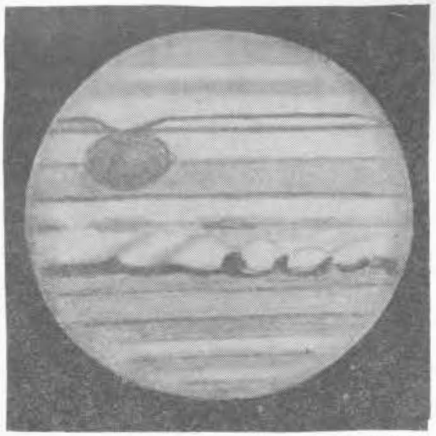


FIGURE 22. Jupiter. Alika K. Herring. 12.5-in. refl. May 9, 1960. 10^h 31^m U. T. C.M. I=65°. C.M. II= 12°. Note RS & FA near conjunction.

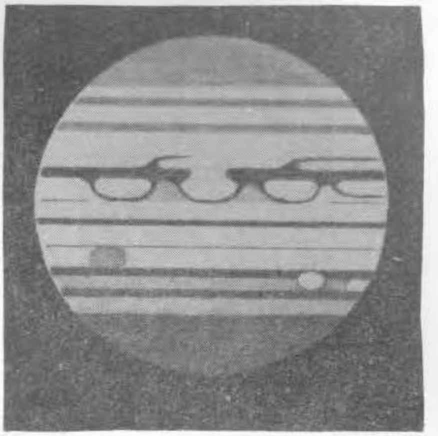


FIGURE 23. Jupiter. Carlos E. Rost. 6-in. refl. June 21, 1960. 0^h 54^m U. T. C.M. I=29°. C.M. II=11°. North is at top, prec. direction of longitude at left. Note RS & BC.

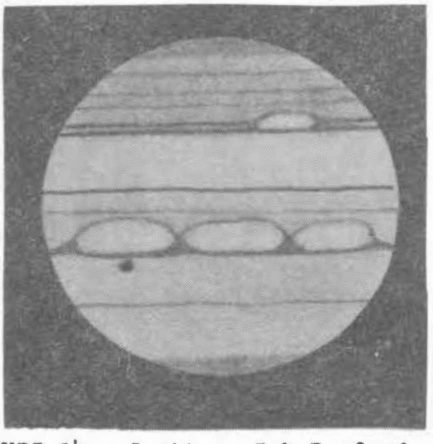


FIGURE 24. Jupiter. Bob Danford. 12-inch refl. July 6, 1960. 3^h 40^m U.T. C.M. I=340°. C.M. II=207°. J I shadow in transit. DE well seen.

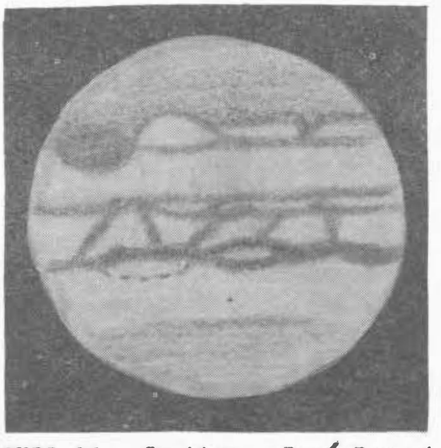


FIGURE 25. Jupiter. René Doucet. 5-in. refr. July 27, 1960. 1^h 05^m U.T. C.M. I=323°. C.M. II=30°. Note RS & BC.

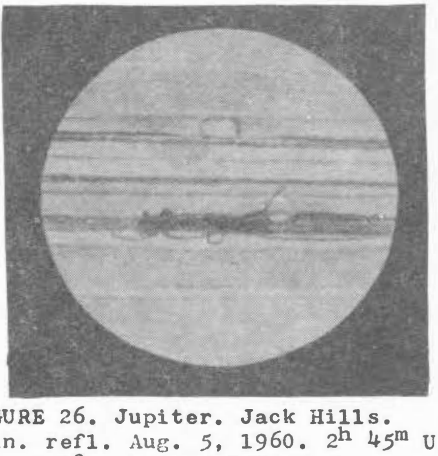


FIGURE 26. Jupiter. Jack Hills. 8-in. refl. Aug. 5, 1960. 2^h 45^m U.T. C.M. I=5°. C.M. II=3°. RS & BC near conjunction.

FIGURE 27. Jupiter. William K. Hartmann. 13-in. refr. Aug. 12, 1960. 4^h 16^m U.T. C.M. I=85°. C.M. II=29°. RS & BC near conjunction. J I at first contact.

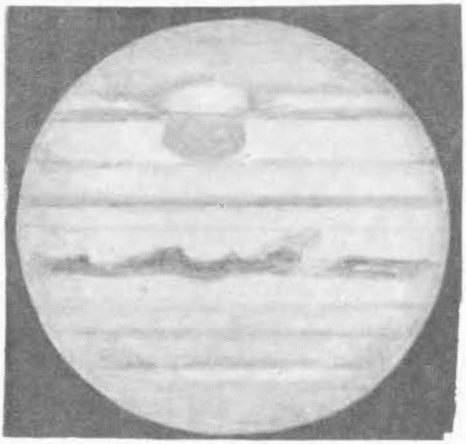


FIGURE 28. Jupiter. Charles M. Cyrus. 10-in. refl. August 27, 1960. $0^h 45^m$-$0^h 55^m$, U.T. C.M. I=167°. C.M. II=359°. RS and BC in conjunction.

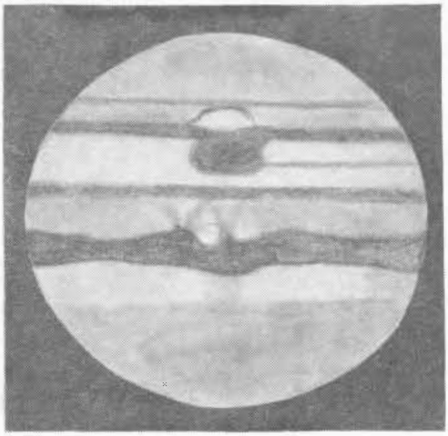


FIGURE 29. Jupiter. Henry Gomez. 6-in. refl. Aug. 31, 1960. $3^h 49^m$ U.T. C.M. I=187°. C.M. II=347°. RS and BC near conjunction.

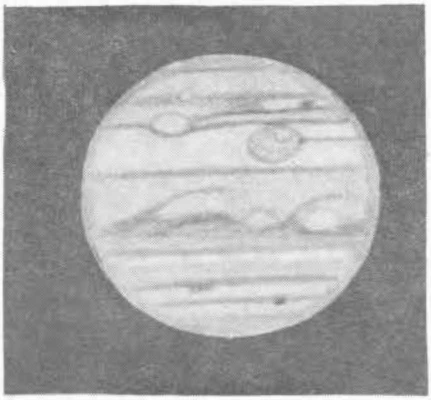


FIGURE 30. Jupiter. Dennis Milon. 8-in. refl. June 12, 1960. $7^h 15^m$ U.T. C.M. I=279°. C.M. II=327°. Note dark rod in NNTB.

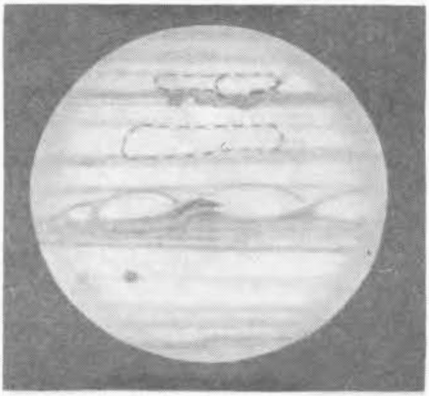


FIGURE 31. Jupiter. Robert R. Provine. 12-in. refl. June 26, 1960. $5^h 30^m$ U.T. C.M. I=267°. C.M. II=209°. Note J III & J III shadow both on disc.

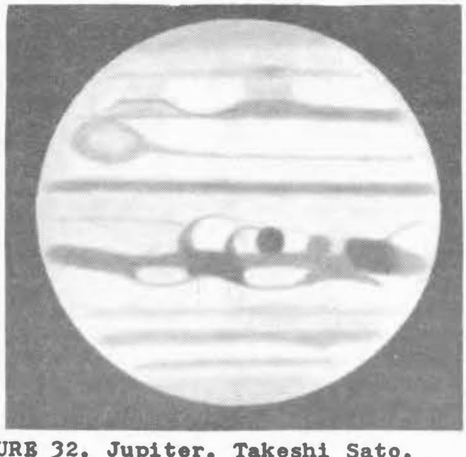


FIGURE 32. Jupiter. Takeshi Sato. 6-in. refl. July 12, 1960. $13^h 40^m$ U.T. C.M. I=214°. C.M. II=32°.

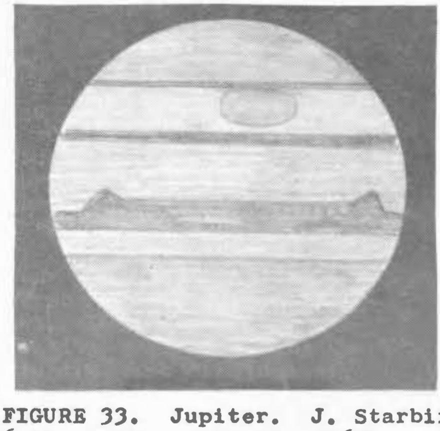


FIGURE 33. Jupiter. J. Starbird. 6-in. refl. July 21, 1960. $4^h 45^m$ U.T. C.M. I=229°. C.M. II=341°.

(Continued from Page 40)

Observer	Telescope(s)	Station
Ronald Storey	2"25 refr.	Mill Valley, Calif.
Joseph Sullivan	3" refr.	Binghamton, N. Y.
Richard F. Tompkins	8" refl.	Jenkintown, Pa.
Joseph P. Vitous	8" refl., 4" refr.	Berwyn, Ill.
George Wedge	6"5 refr.	Montreal, Quebec, Canada
Gary Wegner	10" refl.	Bothell, Wash.
Richard Wend	13" refl.	West Allis, Wis.
William J. Westbrooke	4" refl.	San Francisco, Calif.
Stephen Zuzze	8" refl.	Fresh Meadows, N. Y.

[Did Mr. Glaser modestly omit to list himself?--Editor.]

SOME OBSERVATIONS OF MERCURY IN JUNE, 1960 AND SOME COMMENTS ON A COMPOSITE DRAWING TECHNIQUE

By: Dale P. Cruikshank

Observations of Mercury during the evening apparition (eastern elongation) of June, 1960, were obtained by the writer with the Yerkes Observatory 40-inch refractor. Drawings were made on June 4, June 8, June 9, June 18, and June 25. The first four of these were used to make the composite representation of the planet shown in Figure 38 on p. 48. The intensity values indicated on the adjacent schematic diagram on Figure 38 are averages of estimates made on June 4 and June 18. They are based on the standard A.L.P.O. scale of 0 darkest and 10 brightest. These estimates have little value; because Mercury was always observed in daylight, there was no black sky as a basis of reference. The values are, then, relative only to each other and serve only to give a general impression of relative intensities over the surface.

A large, abnormally bright area appeared at the northernmost limb region marked 7 on June 4 and June 8, and at the southern limb region marked 7 on June 4. The first area has been seen in varying form many times in 1958 and 1959 (Cruikshank, 1959).

The convex dotted line on the drawing shows the position of the terminator on June 4; the concave line shows its position on June 18. In this 14-day period the features on the surface naturally shifted toward the left. Positions on drawings after June 4 were approximately corrected for rotation in making the final composite drawing. In this period Mercury librated in longitude from +22° on June 4, to +23° on June 9, and to +19° on June 18 (all eastern librations). Latitude libration in this period was 4°5. [Assuming axis perpendicular to plane of orbit?--Editor.]

Each of the four drawings which comprise the composite was weighted according to the seeing conditions and the general quality of the observation. An attempt was made to correct for the writer's personal equation; the June 4 drawing was his first view of the planet in six months, and the observation on this date is accordingly given slightly lesser significance. The June 18 observation was the most heavily weighted. Seeing was then 7-8 on a scale of 0 to 10 with 10 best. As with all the observations, a yellow (Schott GG-14) filter was used to reduce extrafocal blue light. Magnification was 550X at apertures between 30 and 40 inches. The major features recorded on this June 18 drawing were seen simultaneously by another observer at the 40-inch.

A few notes on the making of composite drawings, this one in particular, may be of interest. All four original sketches were made on the same scale. Six-inch squares of medium weight acetate plastic were placed over each original, and the outlines and rough shadings of the drawing were transferred to the plastic with a soft pencil (soft pencils used by editors and engravers for photocopying serve well). The plastic squares were then placed on top of each other, care being taken to preserve proper orientation.

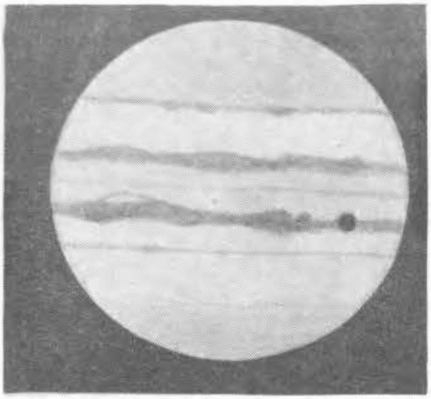


FIGURE 34. Jupiter. Tom C. Constanten. 12.5-in. refl. July 13, 1960. $3^h\ 30^m$ U.T. C.M. I=360°. C.M. II=173°. Shadow of J I on disc.

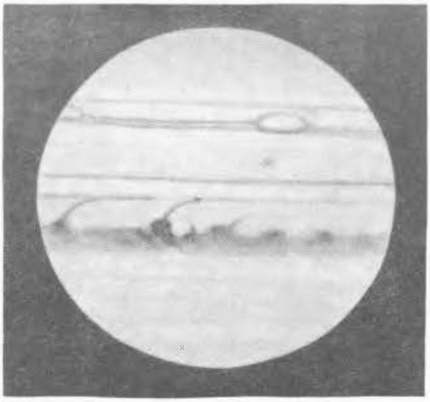


FIGURE 35. Jupiter. Joseph P. Vitous. 8-in. refl. Aug. 26, 1960. $1^h\ 35^m$ U.T. C.M. I=37°. C.M. II=235°. Note DE, FA, & SEB_s Spot 2.

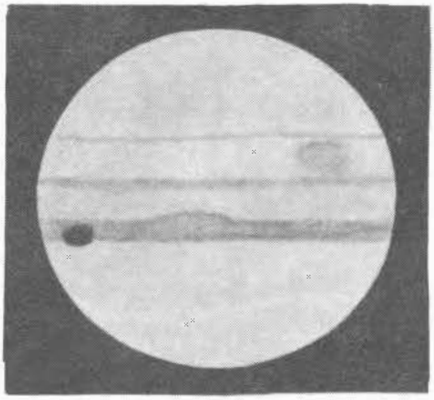


FIGURE 36. Jupiter. José Olivarez. 2.4-in. refr. Sept. 29, 1960. $2^h\ 15^m$ U.T. C.M. I=25°. C.M. II=323°. Note J I shadow on disc.

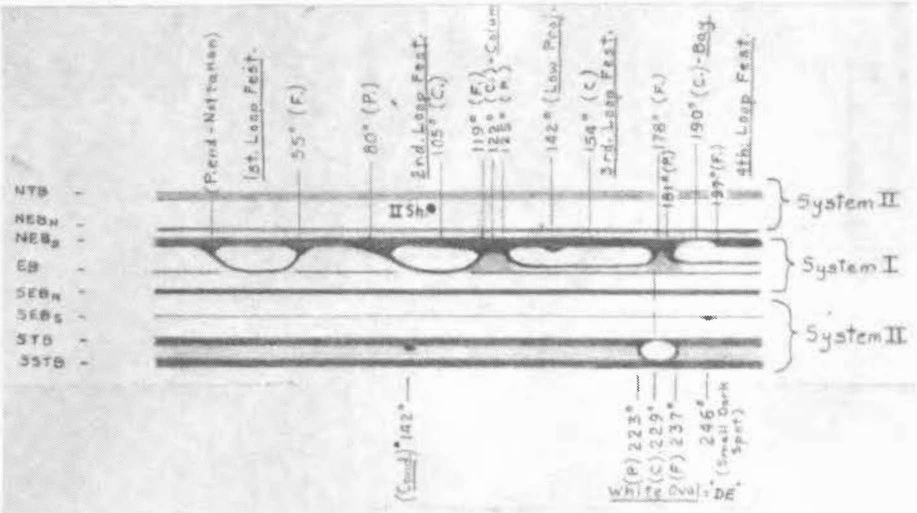


FIGURE 37. Jupiter. Carlos E. Rost. 6-in. refl. June 12, 1960. $1^h\ 07^m$ to $5^h\ 01^m$ U.T. C.M. I=54° to 197°. C.M. II=105° to 246°. North at top, prec. direction in longitude at left. Strip sketch of a 4-hour observation.

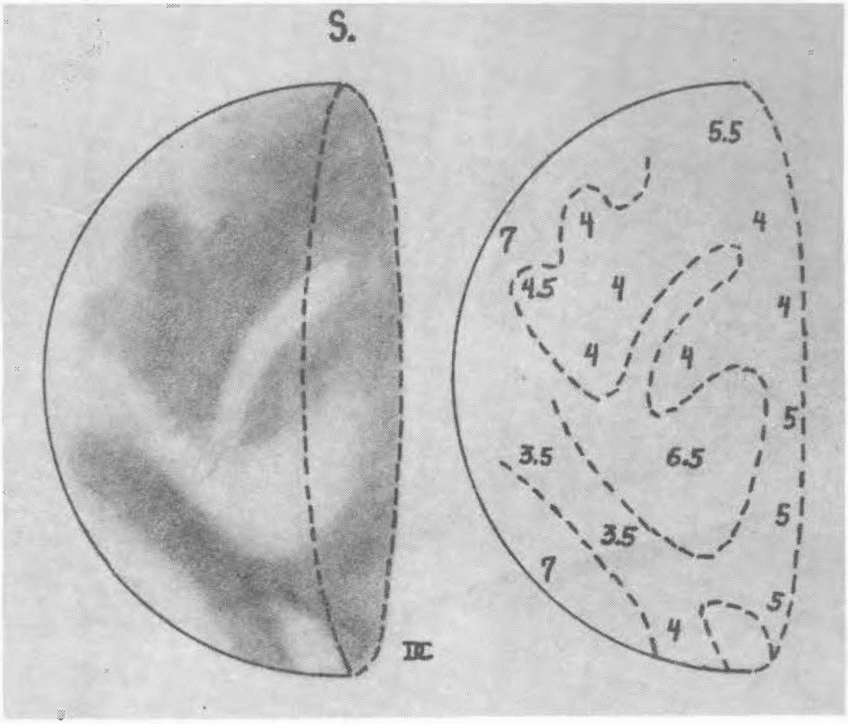


FIGURE 38. Composite drawing of Mercury constructed by Dale P. Cruikshank from four actual drawings with the Yerkes Observatory 40-inch refractor, as follows: June 4, 1960, $0^h\ 10^m$–$0^h\ 30^m$, U.T., seeing 5; June 8, 1960, $0^h\ 0^m$–$0^h\ 25^m$, U.T., seeing 3; June 9, 1960, $0^h\ 0^m$–$0^h\ 36^m$, U.T., seeing 5-6; and June 18, 1960, $0^h\ 20^m$–$0^h\ 55^m$, U.T., seeing 7-8. See also text of Mr. Cruikshank's paper. Simply inverted telescopic image with south at the top.

It was a simple task to see which markings maintained the same general position. The composite final sketch was then prepared as the plastic pieces were viewed on an opal glass viewer, taking into account, of course, the weight of individual observations mentioned before. Because of the difficulty in copying on the plastic overlays, relative intensities of the features were completed with the use of the original drawings.

This method of reproduction is similar to that employed in making composite prints of planetary photographs where several images are obtained at the telescope in a short time interval. In such a case, several of the best images are projected on the same piece of photographic paper in the enlarger, each in turn, and each for a time proportional to its "weight." A fair quality image might receive only one-fourth the exposure of a good quality image. In photography this method serves to enhance faint details not otherwise visible on a print from a single image and to supress grain, emulsion defects, and general lack of sharpness.

Obviously, the composite drawing technique works only for Mercury (unless one still adheres to the sidereal-synodic period for Venus) and then only for drawings made in relatively short time intervals. The fourteen days covered by these observations actually stretch the limit a bit, but the planet passed through dichotomy during this period and the longitudinal libration differential was at a minimum. Nearer conjunction with the sun, the interval would best be shortened, perhaps to about eight days to lessen the libration and rotation effects. Once again, phase changes must also be accounted for; and the final drawing must be reduced to a fixed terminator, as was done here.

This method has at least one obvious disadvantage. If Mercury does possess an atmosphere with opaque or semi-opaque clouds* which sometimes obscure surface features, and if these clouds are sometimes short-lived (a few hours to about two days), the composite image method has the effect of lessening or completely disguising the record from an individual drawing. That is, if a feature is shown on one good drawing but does not appear on two or more others in the same eight- or twelve-day series, one might conclude that the feature is not real. If the finished composite were then intended for map-making, the resulting omission of the obscured feature would be unfortunate.

The above discussion assumes that an observer can secure several drawings of the planet in a relatively short time period. It is the writer's opinion that this procedure is the only way to attack difficult Mercury, with small telescopes or large. Scattered observations--one or two at each apparition--however skilled the observer, can add only a little to our work on the planet.

Reference

Cruikshank, D. P., "Observations of Venus and Mercury with Large Apertures," Str. A., 13, Nos. 9-10, p. 108, September-October, 1959.

ON THE VARIATION OF THE PHASE OF VENUS FROM THEORY

By: Minick Rushton

(Paper read at the Seventh A.L.P.O. Convention at Haverford, Pa., on Sept. 5, 1960.)

The difference between the times of theoretical and observed dichotomy of Venus has long been an established fact. Yet it comes as a surprise to many to learn that this deviation from prediction applies not only to dichotomy, but to all phases of Venus.

In August, 1958, a short article appeared in Sky and Telescope which mentioned the work of two Russian amateurs, Michelson and Petrov, on this subject. Figure 39 shows the results of their work.[1] The vertical axis represents the phase as given by ephemerides. The horizontal axis is the observed phase minus the theoretical phase. The heavy line marks zero deviation. These observations indicate a definite pattern in which the crescent appears larger than expected, while the reverse is true for the gibbous phase. The first question to arise concerning these observations is that of their accuracy. Since the measurements were made from drawings, the question of "personal equation" must be carefully considered.[1] It can be answered in part by the comparison of their work with that of other observers. However, accurate measurements of this phenomenon for extended periods of time are somewhat rare. Henry McEwen, a past Section Director of the British Astronomical Association, made over 900 measurements of the phase variation using a Slade micrometer mounted on a 5-inch altazimuth telescope.[2] The eyepieces employed were a Ramsden of 156 diameters and a Zeiss orthoscopic of 180 diameters. All measurements were made in daylight in order to reduce the effects of irradiation. A discussion of the observations made during the period 1919-1927 appeared in the Journal of the British Astronomical Association. Figure 40 shows the results of McEwen's work. Many observers claim that the retardation of the phase is greater in western elongations (or apparitions) than its acceleration in eastern ones. The graph for the western elongation of 1927 contradicts this belief, for it in no way differs radically from the graphs of the other elongations.[3] However, it must be stressed that the graph represents only twenty-five observations during one elongation.[4] These curves in Figure 40 indicate a

*This matter is open to considerable question in view of the positive observations by Antoniadi, McEwen, Haas, and others; and the recent negative observations by Dollfus at Pic du Midi.

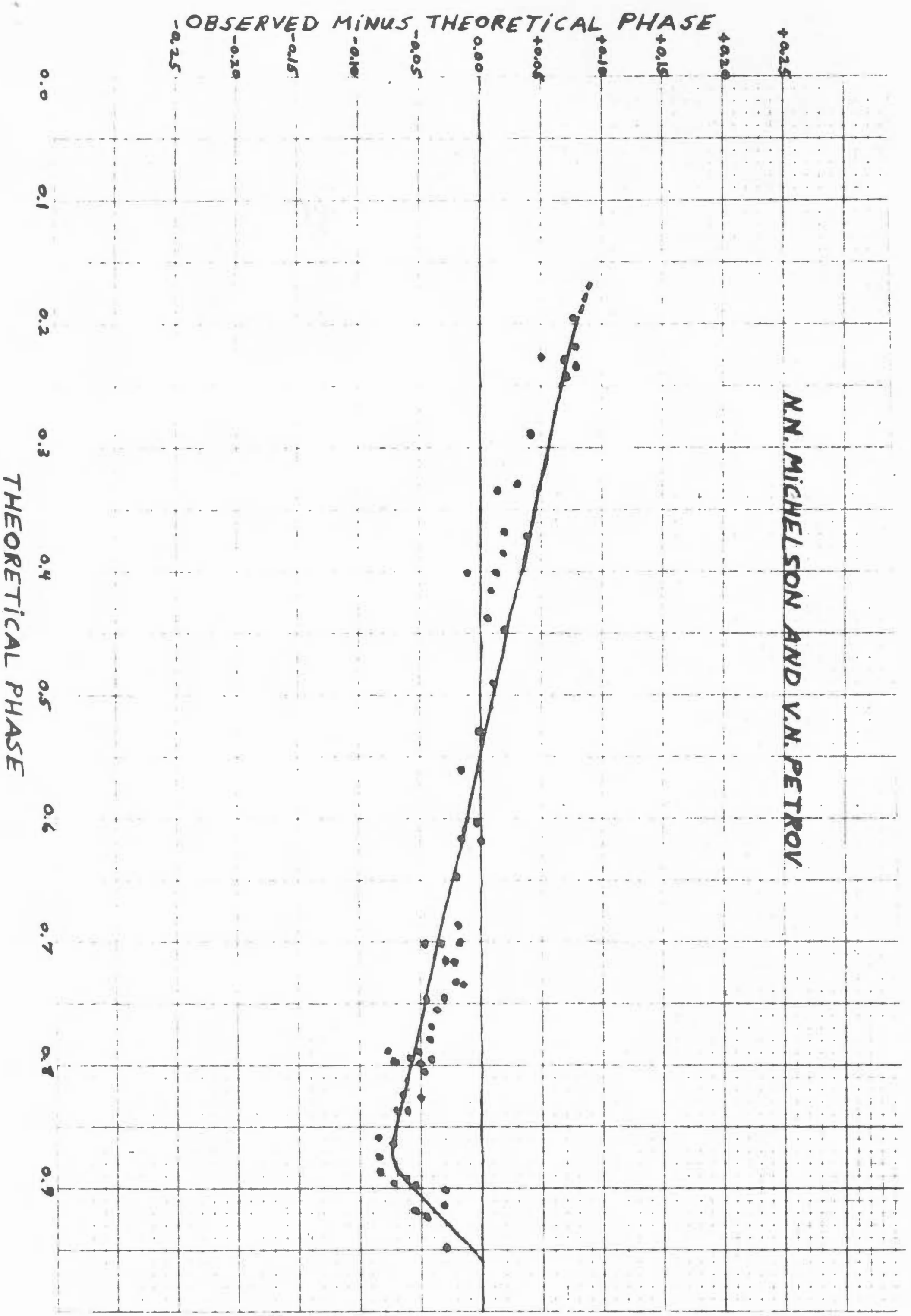


FIGURE 39. Graphical comparison of the observed phase of Venus with the theoretical phase, according to drawings by Michelson and Petrov. See also text of article in this issue by Mr. Minick Rushton.

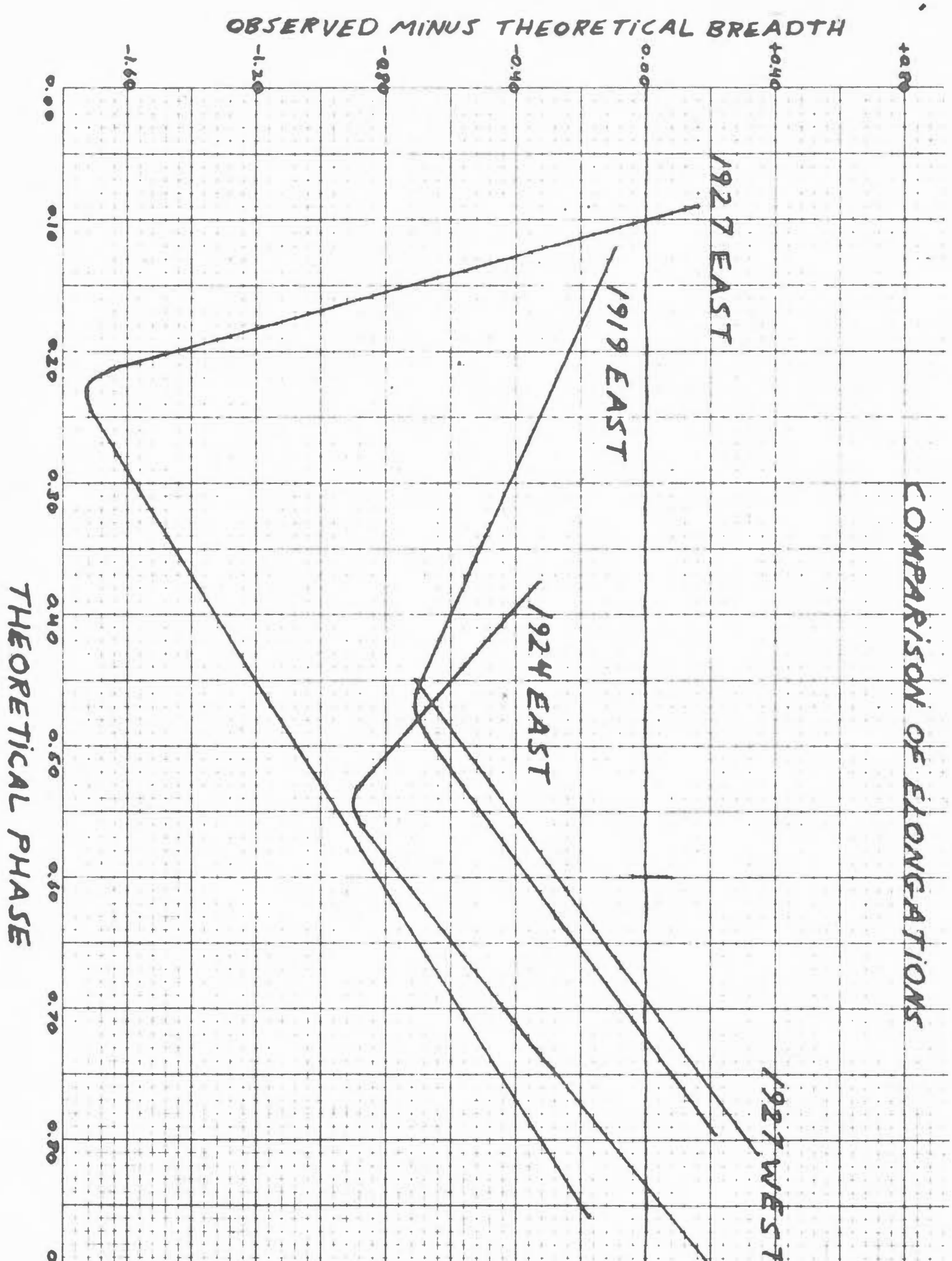


FIGURE 40. Graphical comparison of the observed phase of Venus with the theoretical phase, according to micrometric measures by H. McEwen. See also text of article in this issue by Mr. Minick Rushton.

relatively constant rate of change during the gibbous phase of the planet with the maximum deviation occurring near the time of dichotomy, although the evidence is insufficient to give more than a strong indication of this condition.

It is, of course, obvious that McEwen's results differ radically from those of Michelson and Petrov. While the two sets of results agree approximately as to the degree of the variation, they disagree entirely on its distribution. McEwen shows the planet as being smaller than its theoretical size, except near conjunctions. Michelson and Petrov show Venus as larger in the crescent phase and smaller in the gibbous phase than theory predicts. Since McEwen's measurements were made at the telescope, and not from drawings, his results may be considered the more reliable of the two sets.

The variation between the times of observed and theoretical dichotomy, although only a small part of the more general problem, is the best observed part of the deviation from theory.[5] Apparent dichotomy is invariably late in western elongations (apparitions) and early in eastern ones, but the amount of the deviation from theory is highly variable.[6] However, the average time lag is about $3\frac{1}{2}$-4 days.

The cause of the phase-error can only be guessed at, for the present state of knowledge concerning Venus offers little to explain it. Irradiation and various other factors affecting micrometric observations would tend generally to increase the apparent diameter, not to cause the results which McEwen obtained.[7] One implication of this deficiency of illumination is the stoppage of light in the Venusian atmosphere by some cause other than absorption.[8] Arthur Clayden suggested a sloping cloud surface along the terminator as the answer, but this would require a greater temperature difference between the day and night hemispheres than actually exists.[9]

Many factors--seeing conditions, nearness of dusky markings, aperture, individual visual acuity, depth of the terminator shading, and the sky background--affect estimates of the phase, but their importance is not fully known. A study of the effect of these factors on the apparent terminator is vital to the accurate evaluation of micrometric measurements; but, as yet, this study has not been made. Relatively little work has been done on the phase-error of Venus, except for the short period near dichotomy. The major need is for frequent micrometric observations of the planet's apparent equatorial diameter over extended periods of time. These measurements, which should be made in daylight under standardized conditions, would contribute much to our knowledge of Venus. The previous work gives strong indications of a definite phase-error, but many questions exist as to its nature and degree. Much still remains to be done, yet real progess has been made.

References

1. "Phases of Venus", Sky and Telescope, Volume 17, No. 10, August, 1958, p. 520.

2. McEwen, Henry, "The Terminator of Venus," Journal of the British Astronomical Association, Volume 48, No. 2, December, 1937, p. 63.

3. McEwen, Henry, op. cit., p. 70.

4. McEwen, Henry, op. cit., p. 65.

5. Heath, M. B. B., "Theoretical and Visual Dichotomy of Venus," Journal of the British Astronomical Association, Volume 66, No. 1, December, 1955.

6. Warner, Brian, personal letter, June 25, 1960.

7. Campbell, W. W., "A Determination of the Polar Diameter of Mars," Astronomical Journal, Volume 15, No. 18, September 13, 1895, p. 145.

8. McEwen, Henry, "The Terminator of Venus (Part 2)," Journal of the British Astronomical Association, Volume 48, No. 3, January, 1938, p. 110.

9. Moore, Patrick A., The Planet Venus, Faber and Faber Limited, London, 1956, p. 79.

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1. Heath, M. B. B., "Theoretical and Visual Dichotomy," Journal of the British Astronomical Association, Volume 66, No. 1, December, 1955.

2. McEwen, Henry, "The Terminator of Venus," Journal of the British Astronomical Association, Volume 48, No. 2.

3. Moore, Patrick A., The Planet Venus, Faber and Faber Limited: London, 1956.

SECOND REPORT ON MARS, 1960-1961

By: Ernst E. Both

In addition to the observers listed in our first report in the January-February, 1961, Str. A., the following persons have submitted their observations:

Budine, Phillip W., Binghamton, N. Y., 4-inch refractor, 4 drawings.
Dewart, Lewis, Sunbury, Pa., 6-inch reflector, 4 drawings.
Doucet, René, Cap de la Madeleine, Quebec, Canada, 5-inch refractor, 53 drawings.
Hartmann, William K., New Kensington, Pa., 8-inch reflector, 5 drawings.
Johnson, Lyle T., Welcome, Md., 16-inch reflector, photographs.
Vitous, Joseph P., Berwyn, Ill., 8-inch reflector, 6 drawings.
Wegner, Gary, Bothell, Wash., 10-inch reflector, 32 drawings.

Additional drawings received from the other observers give the following totals to date (February 18, 1961): Both 83, Chapman 47, Schneller 14, Westbrooke 38. Since the current apparition is essentially over, work has already begun on our final reports; and all members are therefore urged to submit their observations by May 15, 1961, at the very latest in order to facilitate the work of the Recorder.

I. The North Polar Cap, December 9, 1960-February 18, 1961

Figure 41 illustrates the shrinkage of the northern cap during this period and continues the curve presented in the first report mentioned above. The mean areocentric angle subtended by the cap was obtained from the following sources:

1. Arithmetic mean of 63 drawings by Both.
2. Arithmetic mean of 23 drawings by Chapman.
3. Arithmetic mean of 33 drawings by Dewart, Doucet, Hartmann, and Vitous.

First, a separate curve was constructed for each of these sources, the final curve being the unweighted mean of the three, each point representing the average of about 4 determinations. To be consistent with the earlier curve, no corrections were applied. On the whole the individual curves all showed the same general trend, most deviations being systematic and probably due to instrumental and personal differences. The scatter between heliocentric longitudes 90° and 100° was apparently due to polar haze, while the deviations between 100° and 110° perhaps represent actual fluctuations in the size of the cap, although these variations may have been smaller than the curve would indicate. It will be recalled that the vernal equinox of the northern hemisphere comes at heliocentric longitude 88°.

It has been the experience of the Recorder (as well as other observers) that the cap is nearly always drawn too large in the first representation of a single observing session, but that this error is usually corrected on the second, third, or fourth drawing of the same session. Because of this trend, isolated observations were not used in the construction of the curve, unless the represented size was of the same order of magnitude as that shown by other observers near the same date. Drawings made with small instruments generally show a cap-size far below that obtained with larger apertures; such drawings will be discussed in our forthcoming report on small telescopes.

II. Further Notes on the Thoth Area

Some preliminary results of our investigation of the development of the dark area around Thoth are presented in the following table, where p=longitude of the preceding edge of the area; c=longitude of the center of the area; f=longitude of the following edge; η =heliocentric longitude of Mars at opposition; De=latitude of the center of the disk at opposition. In several cases (De Vaucouleurs, Miyamoto, Murayama, Both) a number of drawings were measured with an orthographic net.

Year	p	c	f	Width	η	De	Source
1911	250°	254°	258°	8°	62°	- 9°	Antoniadi
1939/41	253	257	261	8			De Vaucouleurs
1946	245	253	260	15	113	+ 8	Saheki
1948	243	254	264	21	148	+18	Wilkinson
1950	249	258	266	17	182	+22	Sadil, Hare, Murayama
1954	244	256	268	24	273	+ 1	Pettit-Richardson, Avigliano
1956	244	253	261	17	348	-19	Saheki
1958	243	255	268	25	53	-13	De Vaucouleurs, Miyamoto, Focas
1960	246	255	264	18	98	+ 2	Both

The table indicates a definite increase in size from 1946 to 1958, while a decrease is apparent in 1960. The low values for 1950 and 1956 may be due to seasonal changes (1950, northern summer; 1956, northern mid-winter). Curiously enough, maximum extent seems to be reached during the northern autumn, winter, and spring (1948, mid-spring; 1954, mid-autumn; 1958, late winter). Evidently the behavior of the dark area around Thoth is dependent on seasonal conditions in the southern hemisphere. On the basis of these data it seems almost certain that this area is definitely decreasing in size.

III. Lunae Lacus and Environs

One of the surprises of the current apparition was the intricate development of Lunae Lacus and its environs (see front cover drawing by Both and Figure 42 by Chapman). This area has been subjected to various secular changes in the past (these are being studied currently by the Recorder), but its development during this apparition was particularly well-followed by Chapman and Both. The entire area will be discussed in greater detail when all observations are available; for the moment we may make the following general comments:

Antoniadi's "Ganges" was usually very broadly diffused and quite dark, the position of its estuary from 8 drawings by Both being: longitude 56°, latitude -8°. Lunae Lacus, at its northern end, was greatly enlarged most of the time (October to January), its relative darkness changing somewhat evidently due to changing atmospheric conditions. The following positions were derived from 8 drawings:

preceding edge, longitude:	61°
center:	72°
following edge:	83°

The latitude of the center was 20° north. Nilokeras, connecting it with the Mare Acidalium, was usually irregular with several darker condensations along its course. Another broad streak, emerging around the end of November (η = about 80°), connected the southern preceding border of Lunae Lacus with the southern following tip of Niliacus Lacus (a sort of "Pseudo-Nilokeras"). Slightly later, Jamuna made its appearance, although it did not seem to reach Niliacus Lacus. Yet a third streak, connecting the southern following tip of Niliacus L. with the center of "Ganges" came into view toward the end of December (η = about 96°). All of these details were recorded independently by Chapman and Both.

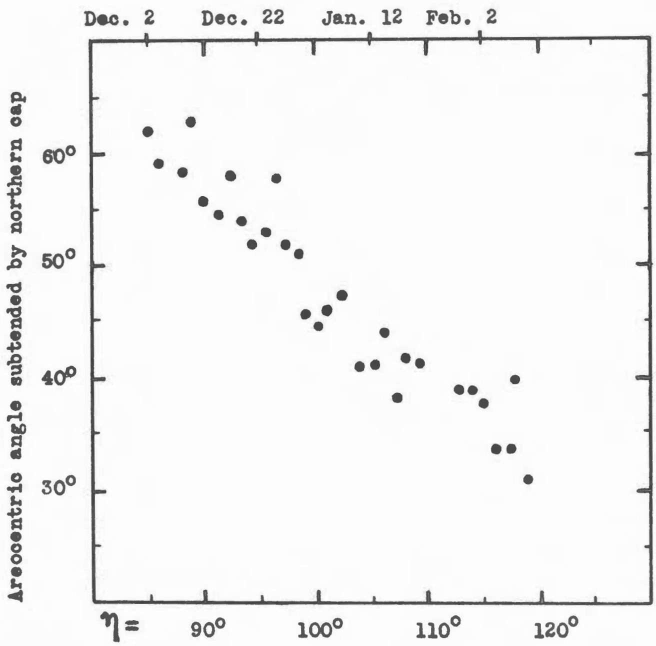


FIGURE 41. Size of the North Polar Cap of Mars, December, 1960-February, 1961, according to observations of the members of the Mars Section of the A.L.P.O. This graph is a time sequel to Figure 8 on p. 27 of the January-February, 1961, <u>Strolling Astronomer</u>. The vernal equinox of the northern hemisphere comes at η = 88°. See also text of E. E. Both's article in this issue.

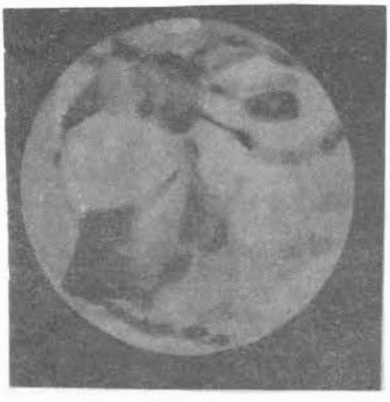


FIGURE 42. Mars. C. R. Chapman. December 20, 1960. $3^h 40^m$ U.T. 10-in. refl. at 300X. Orange 23A filter. Seeing 7-8 (scale of 0 to 10 with 10 best). Transparency 3-4 (scale of 0 to 5 with 5 best). C.M.=56°. Note strong development of Lunae Lacus-Ganges region.

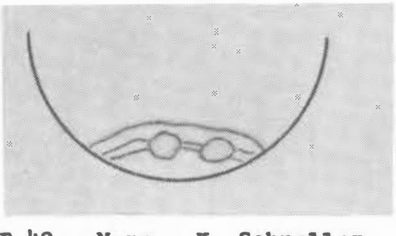


FIGURE 43. Mars. K. Schneller. January 6, 1961. $6^h 16^m$ U.T. 8-inch refl. at 272X. Seeing 9. Transparency 5. C.M.=306°. Note the brighter spots in the North Polar Cap, and refer to accompanying discussion by E. E. Both in text. (Only the North Cap is here represented.)

IV. Trivium Charontis and Environs

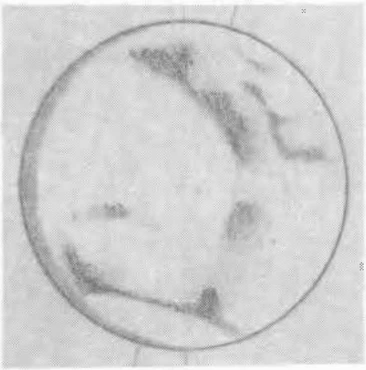
Another interesting development took place north of the Trivium Charontis, involving the general darkening of Phlegra, and the emergence of the Propontis, "Erebus", "Orcus", and "Hecates Lacus." Since this change is a regular seasonal phenomenon taking place during the northern spring, we merely present at this time four drawings of it in Figure 44.

V. Some Interesting Atmospheric Phenomena

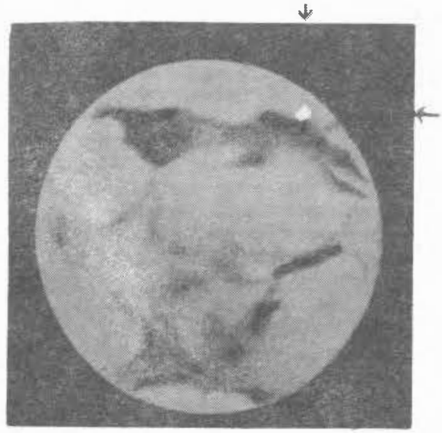
a) Bright spots in the northern cap: A most unusual appearance was noted by Schneller on January 6, 1961, C.M. about 290°. He writes in part: "Filters [what kind?] revealed that at 5:16 U.T. the entire north polar cap was covered with a large yellow cloud...of homogeneous brightness. At 6:02 U.T. (CM=302°) two brighter spots, just barely visible in the polar cap, appeared. Filters showed that they were actually brighter spots in the yellow cloud, being of brightness -0.3 (De Vaucouleurs scale). At 6:16 U.T. (CM=306°) the spots were much brighter and were accompanied by a bright band or zone [see Figure 43]. The spots were of brightness -0.5, the band being much fainter. At 6:26 U.T. (CM=308°) the spots were of brightness -1.2; and at 6:40 U.T. (CM=312°) the spots were very bright, -1.5." Doucet and Both observed about 4 hours earlier, noticing that the north polar cap was "very bright"; but otherwise nothing unusual was seen (Both, 2:00 U.T., CM=243°, and Doucet, 2:15 U.T., CM=247°. Both observers show a bright "cloud" over Libya which the Recorder first noted at 1:15 U.T., CM=232°). The increase in brightness noted by Schneller is very enormous and unusual. Members are urged to check their records in an effort to throw more light on this observation.

b) White band over Elysium: In Figure 45 are reproduced two drawings made by Both on January 11, 1961. A peculiar white band was noticed stretching from the center of the north polar cap across Elysium toward Libya. It was first "observed as a brightness near the limb around 0:00 U.T., CM=170°, but observation was interrupted by clouds and haze. At 1:30 U.T. it was again observed with various filters: absent in red (29), very faint in green (57), similar to appearance in ordinary light (about brightness 1.2, north polar cap at the time 0.9). Dark blue (47B) showed it well, as did also lighter blue filters of unknown characteristics. By 2:30 U.T., CM=206° hardly any trace was left." A drawing by Chapman at 2:10 U.T., CM=202° shows nothing of the streak (at that time it would have easily escaped notice since maximum visibility had occurred at 1:30 U.T. or before. In other words, visibility decreased rapidly as the distance from the limb increased). White bands or steaks of this nature are quite rare, although similar appearances, lasting for a few minutes at a time, were observed on several occasions by N. Barabascheff in 1924 ("Vorläufige Mitteilung über die Marsbeobachtungen im Jahre 1924," <u>Astronomische</u> <u>Nachrichten</u> No. 5341, p. 206, and plate 4).

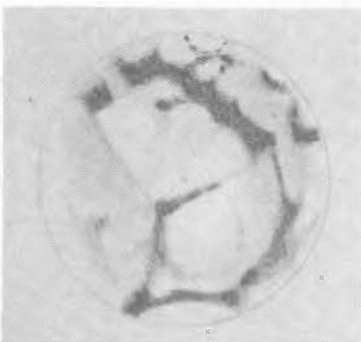
c) Recurrent "cloud" in the southern hemisphere: On January 28, 1961, at 0:27 U.T., CM=25°, Chapman observed a bright cloud in the southern hemisphere and immediately informed the Recorder by telephone. Unfortunately the Recorder was unable to observe at the time because he was recovering from minor surgery. Chapman's cloud was centered at longitude 40°, latitude -48°, i.e. over Argyre. He described it as "brilliant, nearly as bright (without filters) as the cap...its edges...well-defined but not perfectly sharp. It was particularly brilliant in light blue (38) but was also easy with yellow (K2) and orange (23A)." The next opportunity to observe it came on January 30. Using the 8-inch refractor of the Kellogg Observatory, Chapman and Both made two independent drawings (see Figure 46). At 0:47 U.T., CM=12°, Chapman noted that the cloud "was quite bright but considerably less so than the cap. The limb region following Nilokeras and Lunae Lacus was unusually bright." At 1:30 U.T., CM=23°, Both recorded the region of Argyre as being "very bright, with two brighter condensations," while the limb brightness noted earlier by Chapman had become more definite. On February 2, 1961, at 1:00 U.T., CM=348°, Schneller noticed "a huge area of atmospheric haze which covered the Mare Erythraeum. ...I first suspected it when I found it a little difficult to see detail in the southeastern portion of the disk; filters showed that the bulge at the terminator (following south portion of the disk) was due to the haze...though some of it may have been due to slight irradia-



J. Vitous, December 3, 1960
4:45 UT, CM: 224° S: 3
T: 2-3. 8-in. refl. at 209 x



C.R. Chapman, January 10, 1961
0:10 UT, CM: 181° S: 7-8
T: 2-3. 10-in. refl. at 390 x
orange 23A filter



E.E. Both, January 16, 1961
5:10 UT, CM: 201° S: 6
T: 3. 8-in. refr. 500 x

C.R. Chapman, January 15, 1961
2:35 UT, CM: 172° S: 7, T: 3
10-in. refl. at 390 x, orange
23A filter

FIGURE 44. Sample drawings of Mars by A.L.P.O. members in 1960-61, showing strong development of Trivium Charontis and environs. On Chapman's January 10 drawing the arrows point to a whitish blemish.

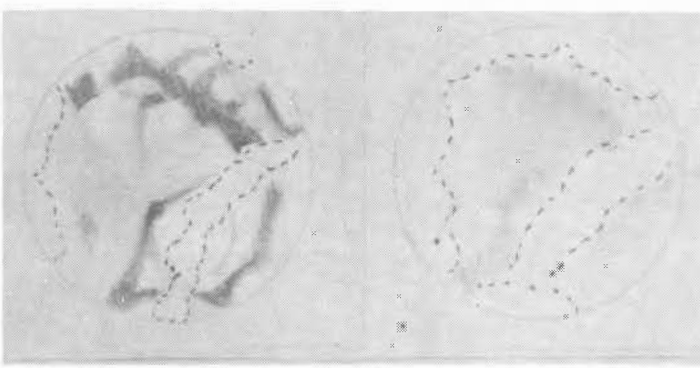


FIGURE 45. Drawings of Mars by E. E. Both on January 11, 1961, at $2^h\ 0^m$, U.T., C.M.= 199°, with an 8-inch refractor at 375X. Seeing 4-5, transparency 3. Left: white light; right: Wratten Filter 47B (blue). Note white band over Elysium, and see text.

tion. The haze was best seen using a yellow filter (maximum transmission at λ =5710 angstroms); it was also seen with a yellow-orange filter (maximum transmission at λ=6200)." (See Figure 47). Three hours later, at 3:00 U.T., CM=17°, Both found no evidence of the haze (what Schneller had observed may have been a more intense sunrise haze, which would rapidly disappear with increasing distance from the limb) although a slight but definite projection was noted, being "apparent in blue, 47B," centered over Argyre. On February 3, 1961, at 2:30 U.T., CM=1°, Both noticed two bright areas, one south of Sinus Meridiani, the other toward Argyre and again slightly projecting. It is quite likely that these observations all relate to the same atmospheric conditions existing over Argyre and probably being connected with the formation of the southern polar cap. From the observations available, it seems that this "cloud" remained essentially stationary during this period (January 28 to February 3).

VI. Personal Comments on the De Vaucouleurs Scale of Intensities

Mr. Reese's criticism of the intensity scale currently used by the Mars Section requires some discussion (see The Strolling Astronomer, Vol. 14, Nov.-Dec., 1960, pp. 190, 192). Concerning the question of whether the scale should be "direct" or "inverse," I would say that it is primarily one of personal preference; for it is very simple to convert from one to the other. Since De Vaucouleurs has successfully used his scale in several thousand (!) estimates, I purposely retained the "inverse" scale to facilitate comparison of his curves with any that we might derive.

The criticism of step 10 ("apparent surface brightness of the night sky background in the immediate vicinity of the planet") is of more fundamental importance and has been voiced by other observers, notably M. De Saussure. ("Observations de Mars en 1956," Orion, Vol. 62, Oct.-Dec., 1958, pp. 500-502. I am grateful to Dr. J. Ashbrook for directing my attention to this paper). De Saussure also prefers a "direct" scale and has designed his own, where:

1...darkest spots on the surface.
7...brightness of the "desert" areas.
10...brightness of the polar caps.

This is the same scale used by W. H. Pickering many years ago ("Monthly Report on Mars--No. 4," Popular Astronomy, Vol. 22, April, 1914, p. 224). De Saussure eliminated the sky background because its brightness "might be variable." De Vaucouleurs clearly states that the brightness of the night sky "is not nil on account of scattering and stray light in the atmosphere, the telescope and the eye and (in refractors) of the secondary spectrum" but that it is "small as compared with the average surface brightness of Mars. It thus constitutes a fairly definite fixed point..." (Physics of the Planet Mars, 1954, p. 315. The brightness also varies somewhat with zenith distance, particulary in cities). Mr. Reese's example of Jupiter's fourth satellite (or any other for that matter) is not quite valid in this case because we are dealing partly with integrated brightness (in the case of J. IV against the sky) differing by as many as 6 to 8 magnitudes (differing, therefore, in brightness by factors on the order of 250 to 1500, the albedo of IV being less than 1/3 that of the average albedo of Jupiter's disk); in other words, the satellite appears dark in front of Jupiter in contrast to the great brightness of its primary, while at the same time the sky behind Jupiter appears even darker. The individual markings either on Jupiter (except satellite shadows) or on Mars will always be far brighter than the average night sky.

Using "the darkest spot on the surface" as a fixed point in the scale is not very practical since the darkest spot of one apparition will not be the darkest spot of the next (because of changing Martian atmospheric conditions and also seasonal and secular changes). And suppose we were using, say, Lunae Lacus as "the darkest spot"--what should we use during the many times when Lunae Lacus is not on the disk? We would have to resort to memory or else have three, four, or more "darkest spots." By adopting such a method we would again be dealing with a non-standardized, qualitative scale, which is precisely what we don't want.

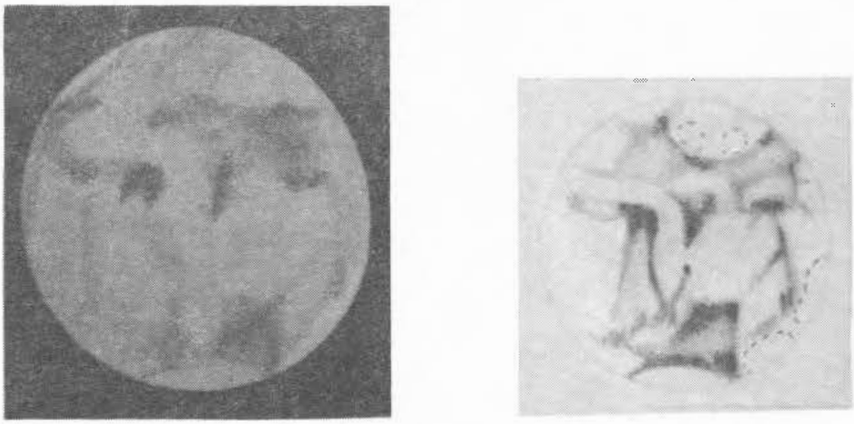


FIGURE 46. Comparative drawings of Mars by C. R. Chapman and E. E. Both on January 30, 1961, with an 8-inch refractor at 375X. Left: Chapman, $0^h\ 47^m$, U.T., C.M.=12°, seeing 5-6, transparency 3-4. Right: Both, $1^h\ 30^m$, U.T., C.M.=23°, seeing 6, transparency 4. Note cloud over Argyre described in text.

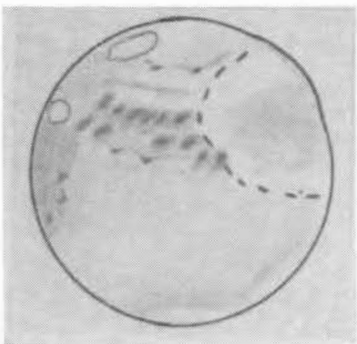


FIGURE 47. Mars. K. Schneller. February 2, 1961. $1^h\ 0^m$, U.T. 8-inch refl. at 272X. Seeing 7-9. Transparency 3. C.M.= 348°. Note extensive atmospheric haze over Mare Erythraeum.

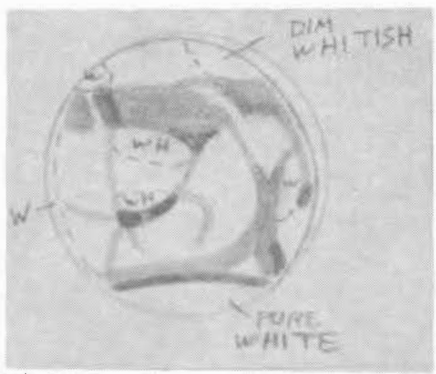


FIGURE 48. Mars. Walter H. Haas. February 14, 1961. $0^h\ 39^m$, U.T. Pan American College 17-in. reflector. About 425X. S=3-4. T=4. Wratten Filter 12 (yellow). D=11"0 C.M. = 233°. W = white area. W = whitish (duller) area.

To be sure, De Saussure found that his scale could be related to that of De Vaucouleurs by:

$$V = -0.68\ S + 6.8,$$

where V = value obtained by De Vaucouleurs, and S = value obtained by De Saussure. However, this relation has to be determined for every series of estimates, so that it would be just as simple to use the other scale to begin with.

Prof. Haas has correctly observed that "actual use will...be the real test of ideas in this field," and since De Vaucouleurs apparently has used his scale on more occasions than anybody else, his experience ought to carry a good deal of weight. As Mars Recorder I shall, for the present at least, retain this scale until it has been tried "in the field" by our own observers.

SATURN IN 1959

By: Thomas A. Cragg

Saturn was less ardently followed in 1959 than in 1958. What observations are at hand indicate that the apparition was rather normal. The July-August, 1960, issue of The Strolling Astronomer contains on p. 123 a recent general nomenclature diagram which will be used in this general summary for naming belts, zones, and ring-features observed.

The following persons contributed observations of Saturn for its 1959 apparition:

Ernst E. Both, Buffalo Museum of Science, Buffalo 11, New York. 8" refractor.
Phillip W. Budine, 1435 Upper Front Street, Binghamton, New York. 4" refractor.
Clark R. Chapman, 2343 Kensington Avenue, Buffalo 26, New York. 10" reflector.
Tom C. Constanten, 1650 Michael Way, Las Vegas, Nevada. 3½" refractor.
John G. Cooper, 23728 - 110th Place West, Edmonds, Washington. 4" reflector.
Thomas A. Cragg, 246 West Beach Avenue, Inglewood 3, California. 6" refractor, 12" reflector, 12" refractor.
Stuart and Stanley Emig, Route 1, Leavenworth, Washington. 8" reflector.
Walter H. Haas, Pan American College Observatory, Edinburg, Texas. 6" reflector, 12½" reflector.
Alika K. Herring, 1312 Arlington Avenue, Anaheim, California. 12½" reflector.
Carlos M. Jensen, 1432 West 4th South, Salt Lake City, Utah. 3½" refractor.
David Meisel, 800 - 8th Street, Fairmont, West Virginia. 8" reflector.
Owen C. Ranck, 112 Broadway, Milton, Pennsylvania. 4" refractor.
Carlos E. Rost, P. O. Box 9933, Santurce, Puerto Rico. 10" reflector.
Frank J. Suler, 508 Morton Street, Richmond, Texas. 8" reflector.
Joseph Sullivan, Jr., 11 Brookfield Road, Binghamton, New York. 3" refractor.
Gary Wegner, 9309 N. E. 191st Street, Bothell, Washington. 10" reflector.

The Ball

EZ: Although the EZ was always the brightest part of the ball, it appeared to be a little fainter than in 1958. Only during September, 1959, was the EZ brighter than the outer part of Ring B. No CM transit observations were received relating to any of the large bright oval spots found in this zone during most apparitions.

EB: This belt was as easy in 1958 as at any time in the past; but it became less obvious in 1959, it appears, being reported much less often in 1959 than in 1958.

NEB: Again this belt was the strongest belt on the planet. Most of the time this feature was double, but it was observed single on a number of occasions. The evidence is that during the first part of the apparition the NEB was single in some longitudes and double in others. Again a rather large number of very transitory dark spots were observed in this belt, but none was of sufficient duration to add materially to our knowledge of rotation-rates at this latitude. Budine and Chapman got a period of $10^h\ 14^m$ from a spot seen on September 5 and 8. Wegner observed three spots on October 3 and a surprisingly similar group of spots on October 30. If we assume that they are the same, a period of about $10^h\ 15^m$ is suggested. Chapman also observed some festoons in August (see Figure 49), one clear to the north pole! These were unconfirmed by other observers.

NTrB: This belt, first reported in 1958, was found by more than half of the contributors. Still basically a narrow belt, it appeared usually a little wider in 1959.

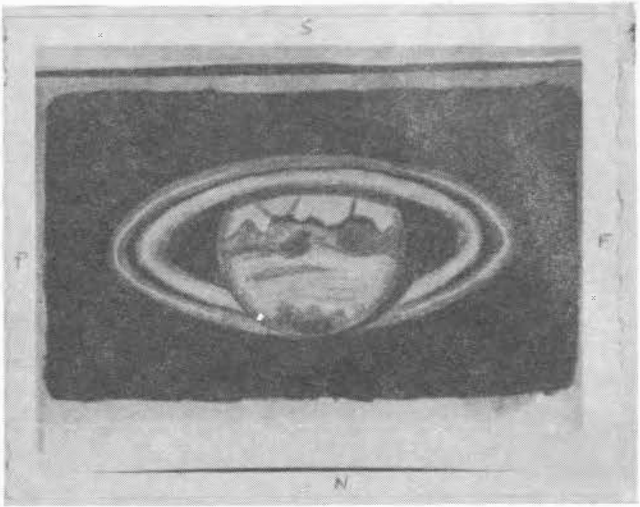


FIGURE 49. Saturn. Clark R. Chapman. 10-inch Cave reflector. 260X. September 8, 1959. $1^h\ 10^m - 1^h\ 35^m$, U.T. Seeing 4-8. Sky rather hazy. Note bright annulus in usual position of Encke's Division, festoons in EZ, and structure of NEB.

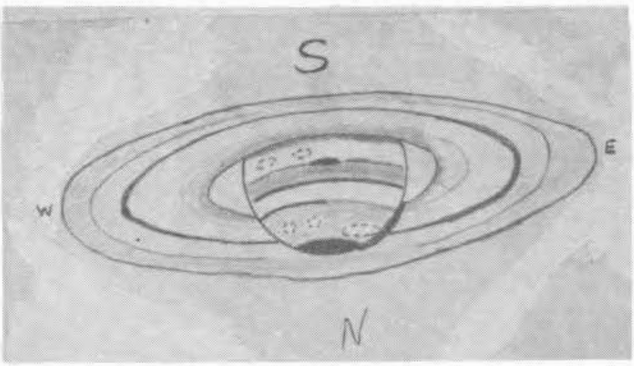


FIGURE 50. Saturn. Phillip W. Budine. 4-inch Unitron refractor. 214X. September 5, 1959. $1^h\ 10^m$, U.T. Seeing 8. Transparency 5. Note bright spots near S. edge N.P.R. shading at the latitude later very active in 1960. (Please ignore any parallel diagonal dark lines visible in Figure 50.)

<u>NTB</u>: Evidence that this belt faded rather rapidly toward the end of the apparition was rather strong. Most of the observers reported this belt through August, but seldom after that. Considerable variation was encountered throughout the apparition, the belt appearing double occasionally as well as sometimes thin and narrow.

<u>NPR</u>: This region, which normally has appeared as a dark cap, was reported at the beginning and end of the apparition, but rather seldom through the middle two-thirds of it. Probably the region was merely lower in contrast during the mid-part of the apparition.

<u>High Latitude Spots</u>: Budine observed several bright spots in a high latitude on September 5 (Figure 50) but unfortunately was unable to recover them. It is to be emphasized that here is the region where our present knowledge of rotation-rates is poorest, and any spots found in this region should be ardently pursued! The remarkable activity in a bright zone at latitude 60°N. in 1960 will be described in a later paper.

The Rings

The ring shadings during 1959 were largely the same as depicted in Figure 8 on p. 123 of the July-August, 1960, <u>Str. A.</u> with one or two exceptions. Once in July Chapman observed a bright line in the position normally occupied by Encke's Division (Figure 49). Also, Budine once observed in July the inner part of Ring B to be brighter than the outer part (opposite to the normal). Haas in October found Ring A to be brightest in a narrow annulus adjacent to the Cassini Division, as he also did in 1958.

Ring D (outside Ring A) was unreported in 1959. It appears so far to remain the general impression that Ring D is harder to see at high inclinations of the rings while basically the opposite is true for the Crape Ring.

Ring Divisions

C5: Not reported by any observers in 1959.

B0: Observed occasionally by Chapman, Cragg, and Haas.

B3: Observed by Chapman, Haas, and Wegner.

B5: Observed a number of times by Cragg and Wegner, and further confirmed by Meisel. Cragg continues to find this division the easiest minor division, sometimes stronger than Encke's.

B7: Not reported by any observers in 1959.

Cassini's Division: Observed by all participants, and found by more than half of the observers all the way around the ring.

Encke's Division: Observed by Budine, Chapman, Cragg, Haas, and Wegner. It was generally placed slightly outside the center of Ring A.

"SAUCERS" IN PTOLEMAEUS

By: Alika K. Herring

(Paper read at the Sixth A.L.P.O. Convention at San Jose, Calif., on August 24, 1960.)

So far as is known, no serious attempt has yet been made to survey or study the very shallow depressions that are found here and there on the lunar surface and which have been popularly referred to as "saucers". Reference to them in the literature is ordinarily casual or vague, with the result that this type of detail is usually dismissed as being of little or no importance. I believe, however, that the contrary should be true. Any comprehensive theory concerning the formation of the lunar craters must also explain the genesis of these saucers. Conversely, any valid theory concerning the origin of these objects may in turn provide us with important clues concerning the formation of the features containing them. The folowing remarks may therefore be of some interest.

Several common characteristics of the saucers may be briefly described. With few exceptions they are rimless, approximately circular in shape, and are of such shallow depth that the sunlight must fall almost at grazing incidence to bring them into relief; in fact the very great majority of them will be totally invisible when more than 12 hours away from the terminator. So shallow is their depth that an observer could be situated in the center of one of them and have absolutely no inkling of the fact; it is even entirely possible that some of our future astronauts may land their moon rockets in the middle of a saucer and be totally unaware of its existence. It is interesting to suggest that if similar shallow depressions exist on the surface of the earth, they will unquestionably remain undiscovered until the earth is observed from some lunar observatory!

It should be noted that the saucers almost invariably occur in either the walled plain type of crater having the dark *maria*-type floors which are relatively smooth and free of detail, or on other portions of the lunar surface which have apparently been inundated by *maria*-type material. This dis-

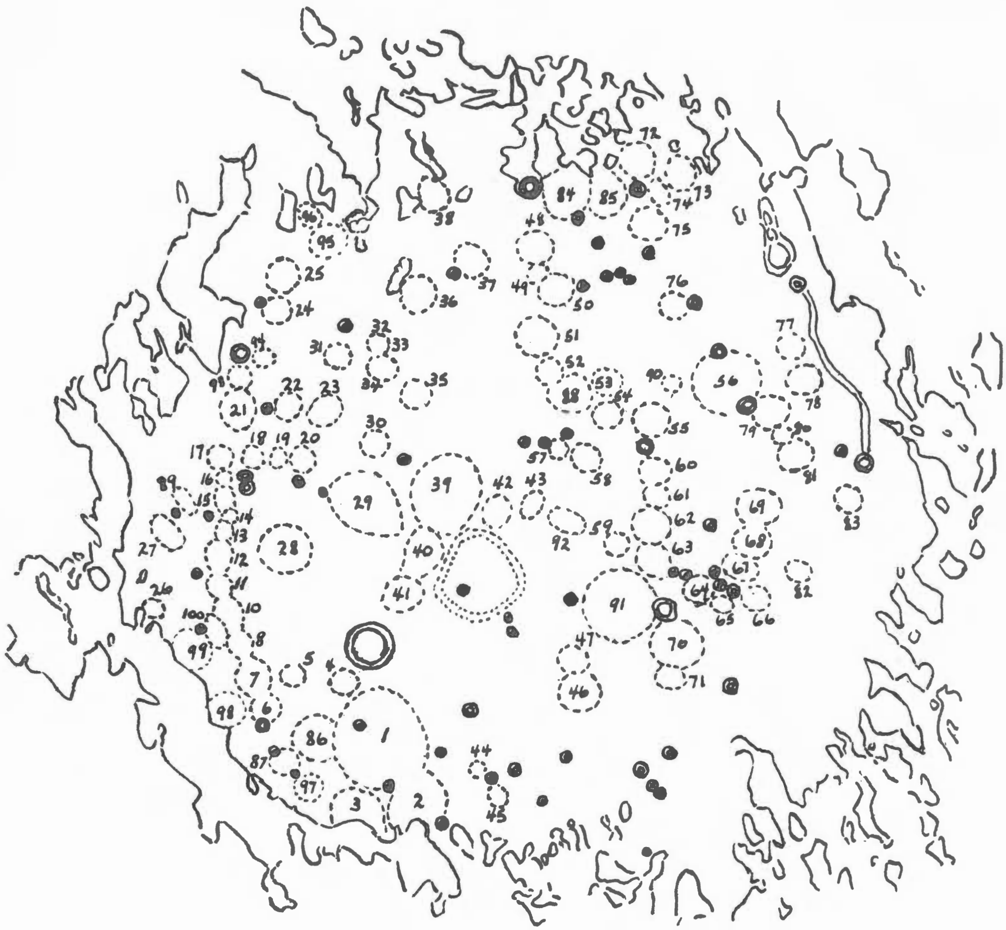


FIGURE 51. Chart by Alika K. Herring of "saucers" in lunar walled plain Ptolemaeus. Chart based upon observations in 1955-59 with 8-inch and 12.5-inch reflectors and upon a photograph by Dr. Dinsmore Alter. See also text of Mr. Herring's paper in this issue.

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tribution is undeniably a fact of some significance. We thus find saucers in Plato, Archimedes, Fracastorius, and other walled plains, as well as in the numerous small inundated areas northwest of Hipparchus in the vicinity of Saunder and Lade. And as with the lunar domes, these features may occur in far larger numbers than has previously been supposed. It is indeed a rare instance when with a fairly large telescope and the proper conditions of seeing and illumination, a number of these objects cannot be found along the terminator at any given time.

Yet perhaps the largest known concentration of saucers will be found on the floor of Ptolemaeus, where they occur in considerable profusion. At this writing, some 100 of these objects have there been charted; and the study is by no means complete. Figure 51 is a preliminary chart by the writer. Of these, number 1, lying closely adjacent to Lyot on the north, is the largest and deepest, and is exceptional in being visible for perhaps several days after sunrise and also several days before sunset.

it is further exceptional in having a low raised rim, which may indicate that this object is better regarded as a buried crater which has been partially covered by a later inundation of the floor of Ptolemaeus. That such inundation has occurred is clearly indicated by the small ghost ring southeast of Lyot.

Attention is also directed to the curious tendency of the saucers on the eastern half of the floor to arrange themselves in semi-circles. Two of these configurations may be easily seen on Figure 51 formed by the saucers numbered 50, 51, 52, 88, 54, 55, and 56 and by 60, 61, 62, 63, 64, 67, 68, and 69. Other less conspicuous arcs are formed by 56, 79, 78, and 77 and by 46, 47, 91, 70, and 71. Another curious arrangement may be found in the chain of partially coalesced saucers, extending from 6 to 95, these forming a long and curved shallow valley which is more or less concentric with the west wall. Such concentricity can hardly be accidental, and implies a connection with hidden crustal weaknesses, perhaps even indicating a distant kinship with the clefts and crater-chains which occur in similar situations elsewhere on the lunar surface.

It is, of course, interesting to speculate on the question of how the saucers may have been formed. While several possible answers may immediately occur to us, I wish to suggest one solution that I believe may have some merit. It can be demonstrated that a pot of melted wax or pitch, after cooling slowly, will not possess a perfectly smooth and level surface, but instead one that is covered with numerous very shallow depressions so slight in depth that they must be viewed from a most oblique angle to be seen at all. And if we but think for a moment, we must realize that these minute irregularities could only have been caused by convection currents in the melted material which persisted up to the actual moment of solidification. Such turbulence, as it might more properly be called, is nature's way of dissipating heat, and may manifest itself in many ways; a good example is the rice grain structure of the solar surface. There is certainly every reason to believe that such turbulence was also present during the cooling of the lunar surface. We admittedly must be extremely wary of attempting to interpret large scale lunar phenomena by small scale laboratory experiments; for if such comparisons were completely valid, it would be a simple matter to prove that the lunar craters were formed in at least a half dozen different ways! So perhaps we should yet consider the question of the saucers to be an open one, and place it alongside the many other lunar mysteries which must await a solution by selenologists in the future.

THE REPORTED OUTBREAK IN ALPHONSUS: AN ANALYSIS

By: Patrick Moore, F.R.A.S., F.R.S.A.

(Paper read at the Sixth A.L.P.O. Convention at San Jose, Calif., on August 24, 1960.)

As on several past occasions, I have been honored with an invitation to submit a paper to an A.L.P.O. Convention; I greatly appreciate this, and am only sorry that I cannot be with you to read it in person. As my subject, I have taken the controversial report by the Russian astronomer N. Kozyrev that on 1958, November 3 a volcanic outbreak was recorded in the lunar crater Alphonsus. The main facts are probably known to most people here today, and the purpose of my paper is to attempt an analysis. However, it may be as well to give a brief statement of what actually happened.

Alphonsus is a particularly prominent crater near the apparent center of the lunar disk. It lies between Ptolemaeus and Arzachel, and has long been regarded as a possible site of variations. During the last century, H. Klein[1] described it as "one of the most active regions on the Moon," and I have collected various other notes leading to the same conclusion[2]. How accurate these reports are is, of course, problematical; and they are certainly not conclusive. Studies of the crater were carried out some years ago by D. Alter, now Director Emeritus of the Griffith Observatory. Following an examination of photographs of Alphonsus taken at Lick in 1937, Alter considered it worthwhile to photograph the region in both infra-red and blue-violet. On the morning of 1956, October 26, under excellent conditions, he obtained results which led him to conclude that in blue-violet, the western part of the floor of Alphonsus was "obscured," while the corresponding area in Arzachel was not. Alter suggested that small amounts of gas were being discharged from the tiny dark spots along some of the clefts.[3]

This research came to the notice of N. Kozyrev, at the Crimean Astrophysical Observatory, who began studies on his own account, using the 50-inch reflector. Kozyrev commented that the lunar surface is exposed to all the hard radiation sent out by the Sun, and he began searching for fluorescent effects due to a very tenuous "atmosphere" inside Alphonsus. It was during this work that he observed his now-famous eruption. Various reports of it have been published, one of which is by Kozyrev himself[4]. While guiding a plate, he noticed that the central peak had become blurred, and was apparently engulfed in a reddish "cloud" which shifted considerably. The slit of the spectrograph was extended in an east-west direction across the central peak, and when the spectrograms were developed they provided confirmation. The observation was made on November 3, between $1^h\ 00^m$ and $3^h\ 45^m$, U.T. When I first heard about it, which was some days later (when the observation was released), I wrote to Kozyrev and asked for additional information. He was kind enough to send me copies of his spectrograms, and also a description of what had been seen. I quote from his letter to me, which I received early in December, 1958:

"On the spectrogram obtained at 1^h U.T., the peak of the crater appears redder than the adjacent floor; possibly at that time the peak was being observed and illuminated by the Sun through the dust thrown up by the eruption. On the spectrogram obtained at $3^h\ 00^m$ - $3^h\ 30^m$, U.T., the spectrum of the peak shows a bright gaseous emission. The most prominent emission bands are at 4756 angstrom units (not yet identified) and the Swan band group, due to C_2 molecules, at 4735, 4713, and 4696 angstroms. Swan bands also occur at 5165 and 5130 angstroms. A group of C_3 lines from 4100 to3950 angstroms is clearly visible, and there are many other lines which have not so far been identified. During the guiding of the spectrogram, I noticed a marked increase in the brilliancy of the area, and an unusual white color. Suddenly the brightness began to lessen. I stopped the exposure and began a new one, from $3^h\ 30^m$ to $3^h\ 45^m$, U.T.; the resulting spectrogram showed the normal appearance."

Here, for the first time, was an observation of activity on the Moon which was confirmed photographically. The news was decidedly unexpected, and was received with some incredulity in Western Europe and the U.S.A.; until I had Kozyrev's letter, I was inclined to believe that there had been some mistake either in the original message or in its translation.

Shortly afterwards, H. P. Wilkins, using his $15\frac{1}{4}$-inch reflector in England, recorded a reddish patch on the site of the "eruption," presumably due to colored material ejected on November 3. Wilkins saw this patch on November 19 and again on December 19; and its existence was confirmed, independently, on both occasions by G. A. Hole using a 24-inch reflector at Brighton.[5] Other observers also have seen it; for instance, on 1960 January 6, B. Warner, at the University of London Observatory, recorded it unmistakably.[6] All this seemed clear enough, but doubts were expressed in various quarters. The reality of Kozyrev's "eruption" was questioned; and some authorities failed to see the subsequent red patch, concluding that it did not exist. Before giving a general summary, it may be as well for me to add what observations I have made on my own account.

I have studied Alphonsus for some years--my first observation of it dates back to 1937--and I think I may claim to be fairly familiar with its topography. The famous dark patches show apparent variations, but these are explained by the changing illumination, and I have yet to record anything in the crater which cannot be accounted for in such a way. Neither, regrettably, have I seen the red patch. I have searched for it on frequent occasions since November, 1958, using mainly my $12\frac{1}{2}$-inch and $8\frac{1}{2}$-inch reflectors, but with no success whatsoever. On 1960, June 3, at $21^h\ 20^m$, U.T., I was observing with G. A. Hole; the instrument was Hole's splended 24-inch reflector, used at the Cassegrain focus. Conditions were fair. Hole could see the red patch; I could not, despite all my efforts. I do not regard this as at all significant. I am not particularly color-sensitive at the best of times.

More interesting is the fact that Kozyrev reported new activity in Alphonsus on the night of 1959, October 23. I was studying the formation between 1^h and 3^h, U.T., using my $8\frac{1}{2}$-inch reflector (trees prevented my using the $12\frac{1}{2}$-inch) and could see nothing unusual. Therefore, anything which took place at that time was, I am sure, beyond the range of my telescope. [See also Str. A. for Jan.-Feb., 1961, p. 7, lines 2 to 8.--Editor.]

If we accept the reality of the outbreak and of the subsequent red patch--or, for that matter, the outbreak only--some interesting conclusions follow. Alter's conjectures will have been borne out; and we will have to agree that minor activity does take place on the Moon, which lends force to the oft-reported "obscurations" in various features which have been noted by almost every serious amateur who has been observing for twenty years or more. It is too much to maintain that the long argument as to the formation of the lunar craters would now be settled in favor of the volcanic theory, but it would appear that the central peak of Alphonsus is associated with vulcanism. We would also have to accept at least isolated pockets of heat below the lunar crust.

It has been suggested that there may have been errors of observation or interpretation. This would indeed be surprising for a man of Kozyrev's experience and reputation; but after studying his account and his confirmatory photographs, I feel that we must reject the "error" idea out of hand. The photographs exist, and they show unmistakable traces of activity. If they are genuine, they prove that activity did occur. There is no room for mistakes made in good faith; if we suppose that no outbreak took place, we must also suppose that Kozyrev deliberately published a false report and followed it up by manufacturing fake spectrograms. This is obviously ludicrous. In the case of the red patch, there is room for honest observational error, since there are no confirmatory photographs. However, further observations should clear the matter up.

My conclusions, therefore, are that there is overwhelming evidence of a minor outbreak in Alphonsus on November 3, 1958, and that some of our ideas as to the inertness of the Moon must be revised. The procedure now must be to keep a close watch on Alphonsus, and I suggest that all those who have suitable equipment should pay constant attention to the whole area.

My very best wishes to you all for an extremely happy and successful Convention.

References

1. H. Klein. "On Some Volcanic Forces in the Moon," Observatory, 5, 253.
2. Patrick Moore. "The History of Alphonsus," Strolling Astronomer, 13, 83.
3. D. Alter. "A Suspected Partial Obscuration on the Floor of Alphonsus," Publ. Astr. Soc. Pacific, 69, 158.
4. N. Kozyrev. "Observation of a Volcanic Process on the Moon," Sky and Telescope, 18, 184.
5. G. A. Hole. "The Alphonsus Eruption Area," Jnl. International Lunar Soc., 1, 90.
6. B. Warner. "Red Spot in Alphonsus," Jnl. International Lunar Soc., 1, 144.

Remarks by Dr. Dinsmore Alter. Dr. Alter offered some informative comments from the floor on the subject of Mr. Moore's paper during the Sixth A.L.P.O. Convention. An edited version follows: "Kozyrev wrote me that the density at the orifice of the craterlet was about one-one billionth (10^{-9}) that of our atmosphere at sea level. He got this value by assuming 100% ionization of the gas, which would be sufficient to produce the effect. Kozyrev's observations are honest and are very valuable; however, his conclusions regarding C_2 can be doubted. There is further evidence that he overlooked something in his report. There is almost no spectrum shorter than 4300 angstroms in the spectrogram showing emission; but this part of the spectrum returned in the immediately following spectrogram, which did not show emission."

PROGRESS REPORT OF THE A.L.P.O. LUNAR METEOR PROJECT IN 1959-1960

By: Robert M. Adams

Herein are presented the results of our 5th year of observations covering the period from Oct. 1, 1959, to Nov. 30, 1960. All participating stations were located at a distance apart sufficient to distinguish lunar flashes from earthly meteors.

The following individual observers were engaged in the meteor search observations for the stated total amounts of time:

H. M. Blake, Tracy, California, 4-1/4" reflector, 2.0 hours.
James Bukowski, San Francisco, California, 4" reflector, 6.1 hours.
Tom Cragg, Inglewood, California, 12-1/2" reflector, 1.5 hours.
Jim Colburn, Oxnard, California, 4" reflector and 6" refractor, 1.8 hours.
Tom Constanten, Las Vegas, Nevada, 3-1/4" refractor, 0.2 hours.
Stuart and Stanley Emig, Leavenworth, Washington, 8" reflector, 2.0 hours.
Val Hennessee, Greensboro, North Carolina, 4-1/4" reflector, 3.4 hours.
Mike Kelly, Neosho, Missouri, 4-3/8" refractor, 0.5 hours.
Robert W. Miller, Miami, Florida, 12-1/2" reflector, 1.0 hours.
William J. Westbrooke, San Francisco, California, 4" reflector, 0.7 hours.

Mr. Craig Johnson observed with his 4" reflector from Boulder, Colorado; and recently he has coordinated his efforts with William Nelson, who uses a 6" reflector. Johnson 7.1 hours, Nelson 0.5 hours.

Observers from Manchester, Connecticut, were divided into two stations: Eugene Spiess with his 5" refractor and Daniel and Doris Fraher, who operate a 3" reflector. Spiess 6.2 hours, the Frahers 4.3 hours.

As in previous years the large group of observers from Montreal was divided into no less than eleven active stations. These are: Miss I. K. Williamson, E. M. Towne, C. M. Good, Mrs. R. Prezament, and Miss C. L. Drolet operating station 1 and using an 80 mm. refractor; Mrs. D. Yane, Louis Duchow, and Mrs. K. Zorgo operating station 2 using a 3" reflector; Miss I. K. Williamson, G. Wedge, S. Downing, C. Papacosmos, and G. Gaherty operating station 4 with a 6-1/2" refractor; G. Gaherty and D. Sands operating station 5 with an 8" reflector; W. A. Warren operating station 8 using a 6" reflector; K. R. Brasch of station 10 using an 8" reflector; Vic Williams of station 14 using a 6" reflector; Mrs. K. Zorgo of station 15 using a 5" reflector; C. Papacosmos and K. R. Brasch operating station 17 utilizing an 8" reflector. There is a map giving the locations of all the Montreal stations. Brasch 2.5 hours, Drolet 0.5 hours, Duchow 0.2 hours, Gaherty 7.4 hours, Good 1.8 hours, Papacosmos 0.4 hours, Prezament 0.5 hours, Sands 0.1 hours, Towne 1.7 hours, Wedge 3.5 hours, Warren 2.9 hours, Williams 10.7 hours, Williamson 5.6 hours, Yane 1.0 hours, and Zorgo 7.2 hours.

The Pittsburgh observers included J. Mullaney using a 2.4" refractor and M. Paston using a 2.4" refractor also. Mullaney 1.5 hours and Paston 0.3 hours.

To Vic Williams goes the honor of having observed the greatest amount of time followed in order by Mr. Gaherty, Mrs. K. Zorgo, and Mr. Craig Johnson.

Since this project is concerned solely with the times of overlapping observations and since space is at a premium in this publication, it is proposed to give a rundown of only those observations where actual overlapping took place. This is a departure from previous procedures when a complete inventory of all reported descriptions of flashes, flares, and trails of light was given. There were again many interesting reports of discoveries of flashes, flares, and trails of light; and we wish to thank all those who submitted positive findings. Due to the enormous difficulty of formulating schedules over such a wide range of time and space, most of the overlapping of observations was achieved by the large Montreal group. Incidentally, all times below have been translated to Universal Time.

On Nov. 5, 1959, Montreal stations 5 and 14 overlapped to the extent of ten minutes from 23:00 to 23:10. On Dec. 4 overlapping was achieved from 23:00 to 24:00 by station 5, 14, and 15, and by the Frahers. Stations 5, 10, and 15, and Paston overlapped from 23:00 to 24:00 U.T. on January 1, 1960. On the 2nd there was overlapping from 23:00 to 23:05 most of the time by stations 1, 5, 14, and 15. On the night of Jan. 31-Feb. 1 there was overlapping for most of the period from 23:44 to 0:30 by stations 1, 5, and 8. Stations 1 and 2 overlapped from 0:00 to 1:00 most of the time on March 1, 1960. On the 2nd four stations overlapped for an hour from 0:00 to 1:00. These stations were 1, 2, 5, and 10. On the 3rd stations 1, 5, and 10 searched from 0:00 to 1:00. It should be pointed out that many of the above stations achieved triple and quadruple overlapping from time to time. On April 2 stations 4 and 14 searched from 0:58 to 1:30. On May 2nd stations 1 and 4 investigated from 2:09 to 2:18. No less than five stations searched on the night of May 3rd: stations 4 and 14 began at 2:30 and continued to 3:30, and stations 8 and 15 began at 2:45, with station 8 stopping at 3:22, U.T. In June, 1960, Montreal stations 2, 4, 8, and 14 watched from 3:00 to 4:00 on the 2nd. There were at least two stations at the telescopes at any one time. Stations 4 and 14 overlapped on July 1st from 3:01 to 3:11. There was triple overlapping from 3:00 to 4:00. Four stations overlapped during August 1st: stations 1, 4, 14, and 15. There was at least triple coverage from 3:00 to 4:00. Spiess and the Frahers overlapped on August 26th from 0:00 to 0:21. Stations 1, 14, and 15 searched with at least partial overlapping and even partial triple overlapping. There were no confirmations in any of the above searches. On August 29th while station 17 was observing from 6:00 to 6:30 Mr. Papacosmos saw an instantaneous flash at 6:10, and Mr. K. Brasch saw one at 6:23. Both objects had trails from which the observers surmised that they were earthly meteors. Mr. Craig Johnson continues to see many flashes and trails, but to date there is no confirmation of his findings. He writes that some of his objects may be psychological in origin. Both Craig Johnson and Tom Cragg searched for lunar meteors during the total phase of the lunar eclipse of September 5, 1960. Mr. Johnson saw a bright flash at 10:38 U.T. about 100 miles S. and E. of Mare Crisium. He saw a bright 0.5 second flare 200 miles south of Aristarchus at 10:55 and a slow streak S. to N. near the limb at 11:14. He saw a flare at 11:39 175 miles S.E. of Plato and a suspected flash at 11:46 just off the west tip of Gassendi. William Nelson searched from 10:55 to 11:20. He states that he saw four flashes practically together at 11:10 plus or minus 30 seconds. Three of them were within 50 miles of Delambre. Mr. Cragg diligently searched with his 12-1/2" reflector during totality, but he did not see any flares or flashes. Stations 1, 8, 14, and 17 of the Montreal team observed on Sept. 26th, but there was a minimum of overlapping. On the 28th stations 1, 4, and 14 overlapped from 1:00 to 1:25. On the 28th(?) stations 1, 4, and 14 observed. Stations 4 and 14 overlapped from 1:13 to 1:25. On Nov. 22, 1960, stations 1 and 5 overlapped from 23:19 to 23:23, although each team observed for a much longer period of time without overlapping. On the 23rd at least two of stations 1, 5, 14, and 15 overlapped from 23:00 to 24:00, U.T.

Once more we are confronted with no confirmations by means of overlapping observations. And once more we are obligated to the Montreal team which produced by far the greatest number of observations.

It occurs to this writer that there is a possible whole new approach to our problem of lunar meteor verification. This idea is brought to mind by the apparent observation of Lunik II kicking up a dust cloud some forty kilometers in diameter (see Sky and Telescope, November, 1960, page 265). Any cursory examination of the area south of Autolycus shows many dark spots, but the possible verification by two stations (still awaiting photographic confirmation) gives us a new modus operandi. Why not set aside at least a half hour every month for searching an area 100 miles wide along the terminator on the bright side of the lunar surface on the night of First Quarter? This search might also be attempted on the night before First Quarter and on the night after First Quarter. This would all be in addition to our customary observations of the earthlit portion of the lunar surface. A plausible reason for taking the First Quarter is that it is an easy date for all to remember, and most of us can search at the same time (weather conditions permitting). The rays of the sun are at an acute angle along the terminator affording easy visibility of possible dust clouds.* With this in mind the writer is offering a schedule (use Central Standard Time):

1961,	Dec. -	6:00 to 6:30, P.M.
	Nov. -	6:30 to 7:00, P.M.
	Oct. -	7:00 to 7:30, P.M.
	Sept.-April	7:30 to 8:00, P.M.
	Aug. -May	8:00 to 8:30, P.M.
	July -June	8:30 to 9:00, P.M.

The sky need not be completely dark for this kind of observation.

Please continue observations for lunar meteors as indicated by flashes, flares, and streaks of light as in the past. Again this writer wishes to thank all of those who have so generously given of their time to the lunar meteor project.

BOOK REVIEW

Der Sternenhimmel 1961. Edited by Robert A. Naef. Aarau, Switzerland: H. R. Sauerlaender & Co., 142 pages. Available in the U.S. through Mr. Albert J. Phiebig, POB 352, White Plains, N. Y. Numerous illustrations and diagrams.

Reviewed by Ernst E. Both

This very excellent observing handbook has been a faithful and handy companion for the past 21 years. This year the well-known format and arrangement have again been retained: explanation of use; observable phenomena in 1961; celestial calendars for each month with monthly star charts; positions of the sun, planets, and the moon in 1961; planetary data (including the larger asteroids); a list of Swiss observatories (the number listed is about 38, including private observatories); detailed lists of interesting celestial objects; directions on how to find the brighter stars; and various explanations of symbols and terms used.

M. Du Matheray's map of Mars, based on personal observations in 1941-1952, is again reproduced; but the nomenclature has been changed to conform with that proposed by Section 16b of the International Astronomical Union. Here is one of the finest of the modern maps of Mars, and the new nomenclature ought to increase its usefulness considerably. The small general map of the moon, which had appeared in last year's issue, has unfortunately been omitted.

A great variety of charts and diagrams add materially to anyone's enjoyment of the booklet. Outstanding among these are: elongations of Mercury in 1961, total solar eclipse of February 15, 1961, a comparison of the motion of Venus through Aries in 1945 and 1961, and the positions of Ceres and Vesta for this year. Particularly the monthly celestial calendars are a mine of information, giving, among many other things, minima

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*According to the observations of Lunik II there was a rapid expansion of the dust cloud from a minute black spot to a greying area of over 40 kilometers in diameter which rapidly disappeared, the whole phenomenon taking only a very few minutes. According to Prof. Haas in a letter to the writer, dust will fall back to the lunar surface according to the approximate formula $s=2.6\ t^2$. Thus it will fall some 9500 feet in one minute so that the whole process of rising and falling might require in the neighborhood of 3 to 5 minutes. It appears probable that dust clouds produced by meteorites much smaller than Lunik II will escape ordinary telescopes.

of Algol, phenomena of Jupiter's satellites, selected central meridians of Mars, occultations, meteor showers, periodic comets, etc. It is astonishing how much Robert A. Naef manages to present in a few pages!

Although written in German, Der Sternenhimmel has symbols so easily understood that they ought to make this book a valuable addition to the library of anybody seriously interested in following celestial phenomena.

ANNOUNCEMENTS

Errors in Recent Issues. On p. 169 of our November-December, 1960, issue we erred in inferring that Mr. Takeshi Sato saw the dark hemisphere of Venus to be "darker than the sky." He actually did not see the dark hemisphere at all. We are sorry that Dr. Bartlett unintentionally erred in interpreting the language of our Japanese colleague's report. On p. 33, line 9 of the January-February, 1961, Strolling Astronomer read 3° in place of $4^{\circ}.8$. We have now learned that Mr. Almen's drawing of Venus reproduced as Figure 27 on p. 176 of our November-December, 1960, issue is merely upside down relative to the simply inverted view--it has north at the top and west (as a direction in the earth's sky) at the right.

Change in Saturn Section. Mr. Phillip W. Budine has with regret given up the post of Assistant Saturn Recorder because of the pressure of many other matters. Mr. Budine has often served the A.L.P.O. well, and we are extremely sorry that he cannot continue. At present no new Assistant Saturn Recorder has been appointed. All current observations of Saturn should be mailed to Mr. Thomas Cragg, 246 W. Beach Ave., Inglewood 3, Calif., as well as any 1960 data yet unreported.

Concerning International Cooperation among Lunar and Planetary Observers. The following remarks on this important subject by Mr. Elmer J. Reese will be worth some careful thought: "On the subject of greater international teamwork in planetary observing, I might offer a few rather hastily formed opinions. The great need, I think, is for greater cooperation among the staff members of the various 'national' associations rather than a direct funnelling of world-wide observations to one place. There is an optimum number of observations which any one Recorder can efficiently analyze. The staff members should keep each other better informed on important developments and forward to each other certain 'cream of the crop' observations which their experience tells them will be of great value to all. There should also be a better distribution of published reports. (My limited dealings with the B.A.A. make these ideas seem desirable but impractical.)"

It has never been the intention of the A.L.P.O. to be a restricted American group; but it is true in reality that perhaps 80% of the members have lived, and do live, in the United States. Mr. Reese's concepts are at some variance with those practiced by the Editor, who has always requested colleagues overseas to submit observational reports to the proper Section Recorders. Mr. Reese's ideas may well be closer, however, to what can actually be accomplished. The Editor frequently has urged upon our Recorders that improved and closer teamwork with lunar and planetary groups in other countries is a major goal of the A.L.P.O. Some of our staff members have made earnest efforts in this direction; others, few or none. We should heartily welcome discussion of Mr. Reese's ideas; and the most important reaction will obviously be that of staff members of active "national" groups in England, Japan, New Zealand, Germany, and elsewhere.

Ninth A.L.P.O. Convention. The Ninth Convention of the Association of Lunar and Planetary Observers will be held along with the Convention of Western Amateur Astronomers in the Lafayette Hotel at Long Beach, California, on August 24-26, 1961. These W.A.A. meetings have become amateur astronomy's outstanding event of the year on the West Coast. A tentative program includes two Morrison Lectures by foreign astronomers attending the immediately prior meeting of the International Astronomical Union at Berkely, California in August, a tour of the Mount Wilson Observatory, a star party at a substantial altitude, and the customary Final Banquet. The A.L.P.O. sessions for papers are tentatively set for the afternoon of August 24 (Thurs.)

TWO LATE ANNOUNCEMENTS. APRIL 10, 1961.

We have now luckily secured as the A.L.P.O. Exhibit Chairman for our Eighth Convention at Detroit:

Clark Chapman
2343 Kensington Ave.
Buffalo 26, New York

Our Chairman's meritorous observational studies will be known to readers of recent issues of this periodical. Mr. Chapman pleads with all members to submit their drawings, charts, and photographs as soon as possible. It takes time to assemble a good exhibit, and we do want a fine display at Detroit. Material sent can be returned. Items exhibited at Detroit can also be used at our Ninth Convention at Long Beach, Calif. in late August and thus do double duty.

We have also found an acting Assistant Saturn Recorder, namely:

Dr. Joel W. Goodman
329 Edgewood Avenue
Mill Valley, Calif.

Dr. Goodman has been active in the A.L.P.O. for a number of years. He now carries on teaching and research at the School of Medicine of the University of California Medical Center in San Francisco. It has not yet been worked out in detail how Dr. Goodman and Mr Cragg will divide the work of the Saturn Section. For the present observations of the Ringed Planet may be sent to either of them.

and the morning of August 26 (Sat.). The annual G. Bruce Blair Award will be given to Mr. Carl Wells of Roseville, California, for his long and outstanding service to amateur astronomy. Mr. Wells is one of the founders of the W.A.A. He is a professional in optics; and his instruments include the mirror for an 8-inch Maksutov for the University of California at Berkeley, a 6-inch refractor for the Nevada Astronomical Society, the first mirror for the Franklin Wright Camera, and a 12-inch mirror for Sacramento City College. He has always been extremely helpful to amateurs with advice, lectures, correspondence, and loans of instruments. The Lafayette Hotel will have plenty of highly suitable room for exhibits, and an extensive display of current A.L.P.O. work is hence desired. An outstanding gathering at Long Beach seems assured; and we urge all who possibly can to attend for information, fun, and good astronomical fellowship.

The W.A.A. Convention Chairman is our old-time colleague, Tom Cave, 4137 E. Anaheim St., Long Beach 4, California.

Further Notes on Eighth A.L.P.O. Convention. It will be recalled that this meeting will be part of the Astronomical League National Convention at the Henrose Hotel in Detroit, Michigan, on July 1, 2, and 3, 1961. The General Chairman is Dr. C. D. Marshall, 17396 Westmoreland Road, Detroit 19, Michigan. There will be plenty of space for astronomical exhibits. A very large display of amateur telescopes is planned. The A.L.P.O. Convention will be held from 9:30 A.M. to 12:30 P.M. on Sunday, July 2. Registration payments should be sent to Mr. George Meyerson, 19777 Cheyenne, Detroit 35, Michigan. The cost of registration is one dollar per person and two dollars and a half per family before June 1, 1961, two dollars per person and five dollars per family after that date. Hotel reservations should be made directly with the Henrose Hotel, Detroit 26. A special Convention rate schedule has been set up and varies according to what accommodations are desired; single rooms, double rooms, and twin rooms are available. Rates begin at $6.50 for single rooms. Two professional astronomers will address the League Convention; these are Professor Haddock of the University of Michigan and Dr. Helen Sawyer Hogg of the David Dunlap Observatory of the University of Toronto. A field trip on the afternoon of July 1 will be made to the Peach Mountain station of the University of Michigan. Here there are two radio telescopes, 28 and 85 feet in diameter respectively, a 36-inch Schmidt camera, and a 24-inch reflector. The 85-feet radio telescope is the fourth largest in the world. The Peach Mountain facility works on a United States Navy Research Project. The customary Honor Dinner will be at 7:30 P.M. on July 2.

We heartily invite all A.L.P.O. members and others who are able to come to Detroit next July.

Program Papers and Exhibits. We still need papers for our programs at Detroit and Long Beach and display material for the A.L.P.O. Exhibit at each place. Members are again invited to contribute. Papers submitted should be typed and double-spaced, and we need two copies. Reading time must not exceed 15 minutes. Practical exhibit material consists of drawings, photographs, and charts. The A.L.P.O. Exhibit Chairman at Long Beach is Mr. Alika K. Herring, 1312 Arlington Ave., Anaheim, California. A Chairman for Detroit will be appointed soon.

Birthday Remembrance. This issue marks the fourteenth anniversary of *The Strolling Astronomer* and the A.L.P.O. Our first six-page, wide-margin issue was mimeographed at Albuquerque, New Mexico, in March, 1947, and went to about 50 persons. It is fitting here to acknowledge the assistance of many, many colleagues in 1947-61 as observers, correspondents, authors, Recorders, helpers at Conventions, and the like. Whatever service we have been able to supply to astronomy rests upon this considerable assistance, so freely and unselfishly given. Our deep thanks!

OBSERVATIONS AND COMMENTS

Lunar and Planetary Research in Japan. Dr. S. Miyamoto, Director of the Kwasan Observatory, University of Kyoto, Japan, has described for us several of their research programs on the moon and planets, as follows:

"(1). Meteorological Study of the Martian Atmosphere. Visual observations with the Cooke 12-inch refractor are concentrated upon the accumulation of meteorological records of the Martian atmosphere. Since the 1956 apparition, the appearance and disappearance of clouds and haze and their drifts by wind have been recorded. Our observations are to be continued until we can reduce from these data the pressure distribution and the general circulation of the Martian atmosphere for every season of the year. Observations and the method of analysis are quite parallel with those obtainable with the Tiros satellite of our earth. In spite of the similarity of rotation period and inclination of the axis between Mars and our earth, the Martian general circulation is expected to show a quite different pattern from ours. At the 1956 apparition we fortunately witnessed the emergence and subsequent development of a great yellow cloud. Photographic recording of Martian clouds with red and blue filters with the new 24-inch reflector at Kwasan Observatory will be started in the near future.

"(2). Geological Study of the Lunar Surface. For the geological study of the lunar surface, a photographic atlas was prepared with the 12-inch Cooke refractor, showing the surface features under different illuminations by the sun. The 24-inch reflector will be used to secure finer details, especially to collect the observational data necessary to criticize theories of lunar maria and crater formation.

"(3). Polarimetric Observation of Venus Clouds. This program will be put in operation with the 24-inch reflector in coöperation with the Pic du Midi Observatory under the **direction of Dr. A. Dollfus.**"

A description of the Kwasan Observatory, with several photographs, appeared upon pages 90 and 91 of Sky and Telescope for February, 1961.

Pan American College Summer Institute in the Astro-Sciences. From June 5 to July 15, 1961, the second annual Institute in the Astro-Sciences will be held at Pan American College at Edinburg, Texas. The program is supported by the National Science Foundation. American high school students in grades 10, 11, and 12 were eligible to apply. (A circular letter was mailed to American members of the A.L.P.O. in March.) Formal instruction will be in two parts: first astronautics and space technology, and second astronomy and astrophysics. The principal telescope at Pan American College is Professor Engle's 17-inch reflector. A trip to the developing Infiernillo High Altitude Observatory south of Monterrey, Mexico, and 10,391 feet above sea level will be made. The latitude of Edinburg (26°18'N.) will be favorable for studies of Jupiter and Saturn at their present large southern declinations, for viewing many southern deep-sky objects, and for some Moonwatch operations.

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By A. P. Norton and J. G. Inglis

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Making Your Own Telescope

By Allyn J. Thompson

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Atlas of the Heavens

Atlas Coeli 1950.0

A striking advance in star atlases has been achieved by Antonin Becvar and his coworkers at the Skalnate Pleso Observatory, Czechoslovakia. The 16 charts cover the entire sky to stellar magnitude 7.75, showing double, multiple, and variable stars; novae, clusters, globulars, and planetaries; bright and dark nebulae; the Milky Way and constellation boundaries.

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Field Edition. The most complete yet inexpensive set of charts for outdoor observing and use at the telescope. Each chart is reduced from the original Atlas Coeli and is printed on a heavy, stiff paper 18 by 12¼ inches. The stars are white on a black background, which may be illuminated with a flashlight without spoiling the observer's dark adaptation. Charts are shipped flat, unbound. **\$4.00 each set, \$7.50 for two**

Atlas Coeli Catalogue

By Antonin Becvar

The most complete check list of celestial objects ever offered to the amateur observer. Listed, with descriptive data, are the 6,362 stars brighter than magnitude 6.26, with their right ascensions and declinations for 1950, precessions, proper motions, magnitudes, and spectra; 293 open star clusters; 100 globular clusters; 240 bright diffuse nebulae; 144 planetaries; 1,131 galaxies; some 1,750 visual double and multiple stars; and 633 variable stars bright enough for amateur observing.

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