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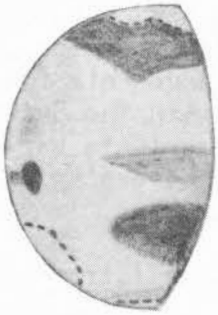

Fig. 1. Mercury
T. Cragg
April 16, 1950.
$2^h\ 50^m$, U.T.
6-in. Refl. 104X.

Fig. 2. Mercury
M.B.B. Heath
April 21, 1950.
$18^h 13^m - 19^h 29^m$, U.T.
10-in. Refl.

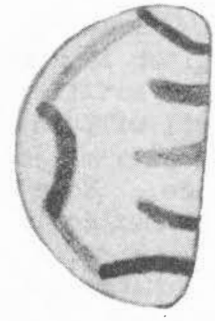

Fig. 3. Mercury
W. H. Haas
April 17, 1950.
$1^h\ 54^m$, U.T.
6-in. Refl. 188X

Fig. 4. Venus.
T. Saheki.
April 20, 1950.
$20^h 30^m$. U.T.
8-in. Refl. 160X-330X

Fig. 5. Venus
H. Le Vaux
April 10, 1950.
$17^h\ 30^m$, U.T.
6-in. Refl. 65X

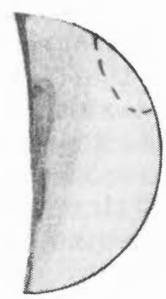

Fig. 6. Venus
G. D. Roth
April 8, 1950.
$4^h 15^m$, U.T.
4-in. Refl. 160X.

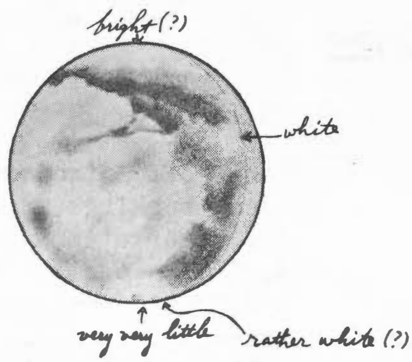

Fig. 7. Mars
S. Ebisawa
June 5, 1950.
$10^h\ 28^m$, U.T.
13-in. Refl. 250X, 375X.
C.M. = 236°.

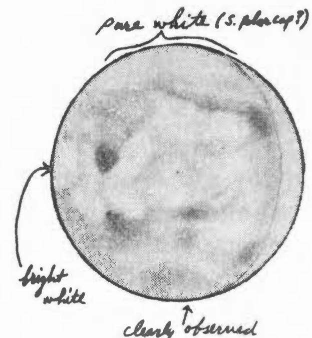

Fig. 8. Mars
S. Ebisawa
July 5, 1950.
$11^h 17^m$, U.T.
13-in. Refl. 250X.
C.M. = 321°.

ANNOUNCEMENTS

Readers are reminded that the address of The Strolling Astronomer and its editor is now 167 W. Lucero, Las Cruces, New Mexico. This address is a temporary one; but it may be used for the present, and proper forwarding arrangements for mail will be made when they become necessary. No longer connected with the University of New Mexico, The Strolling Astronomer is now issued as a private service. However, we are glad to say that Dr. Lincoln La Paz of the University of New Mexico is continuing to act as our Counsellor.

Many persons have inquired in correspondence whether The Strolling Astronomer and the A.L.P.O. are being discontinued. We wish to emphasize that they are not. On the contrary, every effort will be made to maintain and improve The Strolling Astronomer and its services to our members. In particular, we intend to continue the page of illustrations and perhaps even to add a second page of pictures when finances permit. With your cooperation and assistance, we look forward to a bigger and better future for the Association of Lunar and Planetary Observers.

We are very glad to announce the appearance of a new star in the firmament of astronomical journals. The Nova has very distinguished parentage; called The Moon, it is issued by the Lunar Section of the British Astronomical Association. A committee of six well-known British lunarians on its staff is headed by H. P. Wilkins, the B.A.A. Lunar Director. The Moon is intended to be primarily a record of selenographic observations. Line drawings can be reproduced, and the first issue contains a dozen such illustrations. There are ten pages of textual material. Chief attention is given to the topography of our satellite. A.L.P.O. members F. J. Reese and F. F. Hare are mentioned in the first issue. We recommend The Moon highly. Those wishing to subscribe should send five shillings (about 70 cents) to D.W.G. Arthur, F.R.A.S., 35 Vastern Road, Reading, Berkshire, England.

Perhaps no other article ever carried in The Strolling Astronomer received so much and such favorable comment as Dr. James C. Bartlett's "Principles of Environmental Adaptation as Applied to Possible Lunar Plants". We are tentatively planning to carry in our December issue another important article from Dr. Bartlett. Say, if you will, that it is our special Christmas present to you. In the coming article Dr. Bartlett presents very strong evidence for a major topographical change in a large and conspicuous lunar formation. The article is in his usual lively and entertaining style. Enough said now - you'll have to read the article to learn the rest!

MERCURY IN APRIL, 1950

by C. B. Stephenson

In an attempt to obtain simultaneous observations of controversial Mercurian phenomena, viz. of bright spots, changes in dark markings, and the time of occurrence of dichotomy, some time ago requests for observations of Mercury during its very favorable eastern elongation in April, 1950, were sent to many A.L.P.O. observers, at the suggestion of Walter H. Haas. This program was quite successful. Very good reports of observations were received from T. Cragg, Los Angeles, California (6" reflector); Walter H. Haas, Albuquerque, New Mexico (6" reflector); M. B. B. Heath, Kingsteignton, S. Devon, England (10" reflector); L. T. Johnson, La Plata, Maryland (10" reflector); H. Le Vaux, Los Angeles, California (6" reflector); and Donald O'Toole, Vallejo, California (6" reflector).

Others wrote that they would have obtained observations but for weather or other circumstances. A total of 50 drawings was received, made between phase angles 40° on April 7 and 139° on May 3; the observations at these limiting phase angles were made by Mr. Heath. Johnson and Le Vaux made observations with red filters, the latter finding that the prominence of certain areas was enhanced in red light. In order to facilitate comparison of observations of the relative intensity of the various parts of the planet's surface, numerical estimates on a scale of 0 (darkest) to 5 (brightest) were made of the intensities by some observers. In the following discussion all dates are by Universal Time.

The drawings of each observer are fairly consistent internally from day to day, and with regard to the coarser dark detail the drawings of different observers agree rather well. Several uncertain instances of a relative change in intensity of the dark detail were reported but were not confirmed. Cragg felt strongly that what was probably Antoniadi's Solitudo Maiae was less dark than a marking which was possibly S. Phoenicis on April 11, 12, and 16, but that Maiae was darker than Phoenicis on April 18 and 19. O'Toole <u>may</u> have drawn a displaced Maiae and Phoenicis on April 11, but if so, with Maiae the darker. However, this "Maiae" may well be Atlantis. Le Vaux probably saw them as two separate markings only on April 18, when he made Maiae the darker of the two.

The most interesting result of a comparison of the observations is the agreement between all six observers on the presence of a bright area which may represent Antoniadi's bright Argyritis, as suggested by Cragg, on the northwest limb of the planet. A bright region on the southwest limb was also seen by several observers.

The object on the northwest limb was evidently the more prominent of the two. Figures 1, 2, and 3 on pg. 1 are drawings including the spot. It was probably seen by Heath on April 10 and was subsequently seen by him on five dates, a total of six occasions out of the thirteen on which he observed. When seen at all by Heath, the area was not exceeded in brightness by anything else on the planet's surface. He last saw it on May 1, when the disc of the planet was becoming a thin crescent. Cragg drew the feature at every occasion on which he observed. On April 11 he made it and the south cap the brightest parts of the surface, equal to each other in intensity. On April 13 it was brighter than anything else including the cusps and was again so on the 18th, though then smaller and less bright than on the 13th. It had almost disappeared for Cragg by April 19. Johnson also apparently saw the bright area at his every observation, the last one being made on April 27. On April 20 and 27 he made it the brightest region on the planet's surface. Le Vaux drew the spot four to seven times out of a total of ten drawings, the last definite observation falling on April 17 with a possible one on April 30. On April 11 the spot and the south cusp were found to be prominent with a red filter, supporting Cragg's observation of this date. Haas suspected the bright area on April 16 and 17 as the brightest region of the planet, together with the rest of the limb. He may have seen it again on April 24 and 26. O'Toole included the spot in at least four drawings, and perhaps in as many as nine, out of a total of fourteen drawings made between April 11 and April 30. A comparison of all the drawings does not indicate any probably change in this spot in form, position, or brightness, during the period of observation.

A bright area on the southwest limb was probably seen as follows: By Johnson, on April 17 and 27; by Le Vaux, on April 14, 16 (prominent with red filter), 18 (?), probably 19, 25, and possibly April 26 and 30; by Cragg, on April 12 and 19; by O'Toole, on April 16; and by Heath and Haas, not at all, unless as part of the general limb brightness which each usually noted.

Besides the cusp caps, the two areas discussed above were the only well confirmed bright areas seen. Le Vaux in good views saw a considerable number of bright areas, sometimes even lying on the terminator.

Well-defined cusp-caps were not seen by Heath, although the north cusp was found sometimes to exceed the general surface slightly in brightness. He made the south cusp fainter than the general surface on April 13, 20, 21, and May 1; it was at no time brighter than the general limb brightness. The other observers usually saw a bright cap at one or both cusps, sometimes with dark bands bordering them and not always centered on the cusps themselves. The question of whether or not a variation in their relative brightness occurred is best considered through the following table, which emphasizes the difficulty of obtaining consistent observations of phenomena of this sort. Here an <u>S</u> indicates that the south cusp seemed to be the brighter of the two, if only by a small margin, an <u>N</u> that the northern one similarly seemed to be the brighter, and a dash that the two were equal.

	Cragg	Haas	Heath	Johnson	Le Vaux	O'Toole
1950 April 10			N			
11	S				—	S
12	S		N			—
13			N		S	
14			N		S	
15						S
16		N			N	N
17		S		S	S	N
18	S		N		N	S
19		—			N	S
20			N			S
21			N			S
22						S
23						S
24		N				S
25					—	N
26		S				S
27				S		N
29						N
30						N

Cragg always drew definite edges to the bright cusp regions; these limits remained roughly constant from day to day. Haas found any difference in brightness between the two cusps always slight. Le Vaux drew rather irregular edges to the cusp caps. He found the south cusp-cap prominent in red light on April 11. O'Toole often thought that one or both caps projected beyond the curve of the terminator. On April 16 he noted: "The cusp-caps are surely real judging from their appearance." On April 18 he thought that the south cap projected not only beyond the terminator, but beyond the limb as well.

An examination of the table above shows that the evidence for any change in the relative brightness of the caps is <u>very</u> weak.

Two unusual observations were reported: On April 19 Cragg suspected the dark hemisphere; and on April 24, 25, and 26 O'Toole observed two small, exceedingly dark markings centrally placed on the terminator, which were darker than anything ever before seen on Mercury by him. He found them "amazing to see" on the 24th, in good seeing, when they appeared to be as dark as the sky around the planet, or even darker. He could see them at a glance and writes of his observation of them: "...I would like to emphasize the importance and certainty of this observation. When I said these were visible at a glance on the 24th, I was speaking with absolute truth, for the fact is that I did try to see it by merely glancing at the planet, and was easily able to do so. They were intense." Haas on April 24 and 26, and Le Vaux on April 25, did not see anything of this sort; but they observed in poorer seeing than O'Toole. There was nothing unique about the heliocentric longitude of Mercury, the phase angle, or the libration on April 24. The Recorder knows of several instances in the literature in which observers have been surprised by the intense darkness of some marking, especially Criophori; but he knows of none in which the intensity was comparable to the darkness of the sky background around the planet.

We have the following observations relating to the value of the phase angle corresponding to observed dichotomy: Johnson. Terminator slightly concave at $i = 96^{\circ}$. Cragg. Terminator still convex at $i = 88^{\circ}$. Le Vaux. Dichotomy occurred between $i = 79^{\circ}$ and $i = 88^{\circ}$. Heath. From drawings dichotomy occurred at $i = 88^{\circ}$. O'Toole. Terminator straight, with cusps projecting, at $i = 88^{\circ}$. Haas. By interpolation, terminator probably straight at $i = 85^{\circ}$; he kept himself unaware of the true value of i until dichotomy had already occurred, as a precaution against forcing his observations.

The Recorder draws the following conclusions from the observations described in this Report: There is excellent evidence that a noticeably bright area was present on the northwest limb of Mercury during the April apparition and rather good evidence that a less brilliant one was present on the southwest limb during this time. Considering the observations as a whole, these spots seem to have been present throughout the period covered by the observations; and there is no convincing evidence that an appreciable change in their appearance took place. Indeed, the evidence that any surface changes occurred on the planet in April is quite weak. The regions of the cusps of the disc were somewhat brighter than the general surface. Finally, dichotomy probably occurred around $i = 88^{\circ}$, possibly a little earlier.

All things considered, this would seem to be the most fruitful apparition of Mercury that has been observed for quite some time. To the Recorder's knowledge, no apparition of Mercury has ever been as well observed, by a coordinated group, as this one. It is extremely desirable to repeat this attempt to obtain simultaneous observations at the next very favorable evening elongation, in 1951.

Postscript by Editor. The address of Mr. C. B. Stephenson, our former Mercury Recorder, is Yerkes Observatory, Williams Bay, Wisconsin. Mr. Stephenson and the editor hope that this attempt at international cooperative observing of Mercury will be repeated at the favorable evening apparition in the spring of 1951 and that more observers will then actively follow the planet.

Figures 1, 2, and 3 on pg. 1 are drawings of Mercury fairly representative of those upon which this report is based.

OBSERVATIONS AND COMMENTS

Many readers have expressed their appreciation of Dr. James C. Bartlett's article "Principles of Environmental Adaptation as Applied to Possible Lunar Plants", which appeared serially in this periodical early this year. They will surely be interested in the following extract from a letter from Dr. Bartlett on August 8, 1950:-

"In my paper I called attention to certain epiphytes which are equipped with condenser cells, by means of which their aerial roots extract water vapor from the atmosphere and reduce it to liquid water, thereby enabling the plants to thrive without any direct access to water per se.

"In Science for May 19th, 1950, F. C. Stone, F. W. Went, and C. L. Young report the results of their experiments in growing ordinary ground plants in completely dry soil. They find that such plants continue to thrive if the vegetative parts are surrounded by air containing water vapor. The plants establish what the authors call a 'negative transpiration', i.e. they take up water vapor from the atmosphere by ordinary stomata, cuticle, or lenticles, the means by which normally they give it to the atmosphere. Their striking experiments were suggested by observations of certain pines and shrubs on the lower mountain slopes of southern California, which continue to thrive throughout the hottest period of summer during which the soil is below the permanent wilting point for most plants. We thus have a terrestrial example of the highest plants, including the largest forms, getting along quite comfortably without direct access to liquid water".

T. Cragg has submitted a drawing and description of the lunar crater Atlas obtained with the Griffith Observatory 12-inch refractor on August 30 at 11^h (Universal Time here and later). With good seeing and transparency he used a power of 985X, or 82 per inch of aperture. (In the editor's opinion, telescopes of really good optical quality will often bear powers well above the 50 or 60 to the inch frequently given as an upper limit on magnification.) The colongitude was 119°3 so that Atlas was about a day from the sunset terminator. We remind new readers of the definition of colongitude: it is the eastern lunar longitude of the sunrise terminator, measured all the way around up to 360°. At this illumination Cragg found the southern dark area, the northwestern dark area, and the dark band joining them to be faint and inconspicuous. In the southern dark area he saw two tiny craterlets and also two "sink holes" having very dark interiors. The latter, he insists, were definitely not craterlets. Many other topographical features were observed. There were four major cracks on the floor, seen so clearly that their shadowed east walls and illuminated west walls were readily perceived. A pass was clearly visible in the south wall of Atlas. The region east of the central mountains was very rough, and "hundreds" of apparent hillocks were noticed; but the dark band joining the southern and northwestern dark areas looked very smooth and apparently occupied the lowest part of the floor. Cragg wonders whether possibly lunar gases could seep out of the "sink holes" mentioned above and cover the region of the two dark areas and their connecting band.

On April 19, 1950, at $3^h\ 45^m$, and thus when the age of the moon was only 1 day, 19 hours, D. O'Toole suspected that the south cusp of the moon was prolonged by 15 to 20 degrees. He was using a 6-inch reflector at 47X in an unusually clear sky. Possibly the north cusp was prolonged by about 5 degrees. Both suspected prolongations were yellow in color, about the same as the sunlit regions. The south cusp-extension grew thinner and more indefinite with increasing distance from the "true" cusp.

Mr. O'Toole has now concluded that there is nothing remarkable about this "cloud" on the floor of Fracastorius at sunrise (refer to pg. 11 of May issue and pg. 7 of July issue). What is seen, he reports, is merely very poorly illuminated portions of the floor. O'Toole still finds evidence, however, that craterlets on the floor become more readily visible as the solar lighting becomes higher. On July 20 at colongitude 335° he could not see a craterlet southeast of the central hill with a 6-inch reflector at 185X and seeing rather poor to excellent; however, O'Toole and E. E. Hare have seen this craterlet several times with higher solar lighting between colongitudes 351° and 358°. In his July 20 view O'Toole carefully compared the relative darknesses of two equally large shadows in two equally large craterlets on the floor of Fracastorius. He found that one shadow was distinctly darker per unit area than the other. Similarly, a very easily seen difference in darkness exists between the shadows in Eudoxus and Aristotle near the first quarter of the moon. It is usually supposed that sunlight is reflected into lunar shadows to lighten them unequally and thus cause such differences or that one is dealing with very poorly lit and imperfectly seen features within a shadow.

Observations of the lunar crater Conon made during the spring and summer of 1950 and not yet discussed in this periodical have arrived from S. Fbisawa (13-inch refl.), W. H. Haas (6-inch refl.), D. O'Toole (6-inch refl.), E. J. Reese (6-inch refl.), and T. Saheki (8-inch refl.). Much of the material here presented is taken from Mr. Reese's valuable letters. The nomenclature used is Reese's; and his map of Conon reproduced as Figure 1 on pg. 1 of our February, 1950, issue will be very helpful in following this discussion. On March 29 at colongitude 35°3 O'Toole resolved Streak S into a pair of streaks, as Hare and Saheki have also done. O'Toole on the same date saw Reese's two craterlets at the foot of the south inner wall as a pair of difficult bright spots. It is puzzling that Cragg once recorded a pair of peaks in the position of these craterlets. In the spring and summer views here under review Fault B has been much the most conspicuous dark streak in Conon (between colongitudes 20° and 45°) and has been continuous. Indeed, O'Toole and Fbisawa found Fault B an easy object near colongitude 35° in their very first views of Conon in March and July respectively. It thus becomes still more difficult to understand why Fault B went unobserved before 1947. O'Toole and Fbisawa found Fault B slightly darker near its southwest end than in its northeast half. On August 24 at 47°1 Saheki represented B as a very narrow and continuous dark line at the foot of the northwest inner wall of Conon. Haas, perhaps with some confirmation from O'Toole, finds evidence that Fault B is in reality no fault but is instead the shadow of a bright ridge on the northwest inner wall. Fbisawa's two drawings on July 25 at 40°0 and on August 23 at 34°6 are interesting because in poor seeing he found the various dark streaks on the floor difficult and indefinite - indeed, Antoniadian in appearance. Would they have been sharp, dark, and Lowellian to him in his 13-inch telescope with good seeing? Haas has now confirmed the existence of dark streaks B, S, and Z, S being rather diffuse and indefinite. Saheki has recorded dark streaks U, Z, S, V, and B and wall bands A, B, and C. On June 26, 1950, at colongitude 40°5 Reese looked long and carefully but in vain for bright area Q in the south part of the floor. During the better moments a number of familiar features were seen clearly enough, and Q had been readily visible to Reese on April 28 with seeing and colongitude similar to what they were on June 26. However, both Saheki and Haas saw and drew area Q on June 26, Haas observing about three hours after Reese and Saheki about eight hours after Haas. Reese asks: "Can we be certain that real changes do not occur quite rapidly on the moon?" The editor suspects that we cannot be certain at all. On August 22 at 21°2 Saheki apparently drew a tiny crater-pit within bright area O. Reese has glimpsed such a crater-pit, and it is shown in his drawing reproduced as Figure 1 on pg. 1 of our May issue. Saheki, Fbisawa, and Haas found Streak S much more conspicuous than Cleft V during June, July, and August; but we understand that Hare has recently observed exactly the opposite. Interested readers might here also refer to pg. 9 in the April, 1950, Strolling Astronomer. On May 26, 1950, near 21°5 Reese and

Hare did agree that V was much more conspicuous than S. On several dates Saheki depicted two darker condensations on dark band U, just as W. H. Pickering did on March 28, 1920. Reese, however, has recently observed only one condensation on U; and it is midway between the two of Saheki and Pickering. Reese directs attention to what he considers a very remarkable observation by Haas. On August 2, 1941, at colongitude 21°8 Haas drew a wide, rather bright band on the northwest inner wall of Conon and showed it extending up to the very rim. However, he represented the very same area to be almost as dark as shadow on October 30, 1941, at 26°1. The latter is presumably the normal appearance; and we know that the northwest wall will lighten, not darken, as the morning illumination advances.

A principal objective of A.L.P.O. studies of the moon has been to decide whether certain apparent lunar changes are due merely to changing solar illumination or whether they instead indicate real changes on the surface of the moon. If they are due only to changing illumination, then the apparently varying areas should look the same when illuminated by the sun and when illuminated from the same direction by the earth. The editor accordingly attempted some examinations of features on the earthshine in and near 1941 but found the lighting too dim for a sufficiently critical study, even with an 18-inch telescope. Therefore, he was most agreeably surprised to receive a drawing of Grimaldi by earthshine from D. O'Toole, who made it on May 21, 1950, at 4^h 10^m with a 6-inch reflector at 47X. At that time the earth's selenographic longitude was 5°9 east, and hence the appearance should have been the same as at solar colongitude 95°9. By good fortune, we have from Mr. O'Toole a drawing of Grimaldi with his 6-inch reflector on July 11, 1949, at 96°4. There are also available for comparison drawings by E. J. Reese on May 13, 1949, at 94°5 and by J. C. Bartlett on November 6, 1949, at 96°6. The 64-dollar question now becomes: Is the aspect of Grimaldi by earthshine the same as by normal solar illumination? It is difficult to reach an answer (awarded, alas, by no prize) by comparing the drawings cited; but it would be the editor's tentative opinion that O'Toole's earthshine drawing does not show the same aspect as normal drawings near colongitude 95°9. In particular, we should note, as Reese has pointed out, that O'Toole by earthshine shows a brighter area in the southeast part of the floor and makes Grimaldi darkest near its southwest edge. Reese regularly finds the floor darkest near its southeast edge around 95°, and there is certainly no brighter area there on the sunlit drawings by Bartlett and O'Toole cited above. There is no hint of the familiar north-south Central Bright Streak in Grimaldi on O'Toole's earthshine sketch.

We have been pleased to learn from T. Saheki that Japanese observers have begun intensive searches for possible lunar meteors and/or meteoritic impact-flares. Saheki himself from August 17 to August 25 spent 3 hrs. and 4 mins. in examining the earthlit portions of the moon with this objective, using an 8-inch reflector. He saw three transient bright specks. The first one, at 10^h 43^m on August 21, was about the seventh magnitude, lasted for perhaps 0.2 seconds, and had a path about 50 miles long as seen projected on the moon's surface. The second, at 10^h 55^m on August 21, was near 6.5 in magnitude and endured for about 0.5 seconds. A very unusual feature was a strongly curved path, which was about 100 miles long. The third object, at 10^h 55^m on August 25, was a stationary flash, lasting about 0.2 seconds and near 6.5 in magnitude. Its color was yellowish white. Saheki has also communicated redords of four temporary bright spots observed by T. Osawa with a 6-inch reflector. Their times of appearance were 10^h 48^m on August 18, 10^h 54^m on August 18, 11^h 15^m on August 18, and 14^h 17^m on August 30.

The Three August 18 objects, which were stationary, appeared while Saheki was watching the moon with a larger telescope than Osawa had, though probably with poorer seeing; but Saheki did not see them. Osawa here has most confidence in the object he recorded at $11^h\ 15^m$. All four of his objects were near the seventh magnitude, all had angular diameters of one second or less, and all had estimated durations of around 0.8 seconds. They were yellow in color. Osawa's three August 18 objects and Saheki's August 25 object were very close to the east limb of the moon. It does indeed appear surprising that our Japanese colleagues should record seven lunar bright specks in less than a month. Is it possible that the Perseid stream of August enveloped the moon as well as the earth and that brilliand lunar Perseid fireballs were observed? However, the positions and paths of the seven objects as given on outlines of the moon are such that we cannot ascribe all of them to a lunar Perseid radiant.

J. G. Mayen wrote on September 8 that the Glendale, Calif., observers had submitted "no reports of success in spotting bright specks on the earthlit portion of the moon for the past several months. To date we have no case where the same speck was reported as having been seen by two observers."

J. C. Bartlett, Jr., has submitted a set of six drawings of Aristarchus, each accompanied by descriptive notes, made with his 3.5-inch reflector at 100X from July 26 to August 28. This keen student of lunar and planetary colors three times recorded a peculiar hue in part of the crater. On July 26 at colongitude 47°.8 there was a distinct bluish glare along the base of the east inner wall. Bartlett remarks that such a hue is not always visible at comparable colongitudes. A somewhat similar observation is mentioned in Goodacre's <u>Moon</u>. On July 31 at 109°.8 Bartlett found a pronounced violet glare on the northwest wall. On August 28 at 91°.6 there was an intense bluish-violet glare along the west rim, perhaps involving the outer glacis. There may be some resemblance to the July 31 view, but no such color was observed on July 29 at 85°.8. What is the cause of these colors? Bartlett has noticed, as others have done, a remarkably dark nimbus around Aristarchus under high lighting. He gave attention to a bright spot <u>in the middle of a dark band</u> on the east inner wall. This spot was very brilliant from 60°.6 on July 27 to 109°.8 on July 31; it was fully ten in intensity on the Standard Lunar Scale and on July 31 was even brighter than the central peak. However, on August 28 at 91°.6 Bartlett found the same spot so much duller as to be difficult to perceive in spite of excellent seeing. The position of this spot would appear to be close to that of the object represented by Reese <u>between two dark bands</u> in his drawings reproduced as Figures 1 and 2 in our September issue. Reese shows an elongated spot near the foot of the east inner wall on Figure 1 and a pair of spots in the same position on Figure 2. Is it <u>possible</u> that the dark bands shift position relative to bright spots? A hurried examination of drawings of Aristarchus from 1936 to 1950 by such observers as C. M. Cyrus, R. Barker, E. K. White, F. J. Reese, R. Missert, H. Hill, and W. H. Haas reveals <u>many</u> examples of bright spots <u>between</u> the dark bands on the walls, including much confirmation of Reese's object mentioned above, but does not appear to disclose a single example of a conspicuous bright spot seen <u>upon</u> a dark band. Bartlett's drawings appear to show Reese's dark band on the southeast inner wall in its "abnormal" orientation of Figure 2 in our September issue (pp. 12-13 in that issue). It would be very interesting to see whether this indicated abnormality is shown or any other drawings of Aristarchus that our readers may have secured in July and August Dr. Bartlett cites several other examples in his July-August observations of variations in appearance of detail in Aristarchus at similar solar illumination.

We are indebted to T. R. Cave, Jr., for lending us a print of a Lowell Observatory photograph of Mars given him when he visited there last spring. The photograph was made with the 24-inch refractor on March 30, 1950, in red light. We do not know the time at which the photograph was taken, but the central meridian of longitude (C.M.) is evidently near 45°. The print shows such features as the bright space between the north polar band and the north base of Mare Acidalium, Tithonius Lacus, Oxia Palus, and something of Nilokeras canal. On the print the editor measured the angular diameter of the north cap to be 15°5, but the cap was scarcely distinct enough for high accuracy (probably more distinct on original). On a Lowell print in yellow light on the same date, but at a different C.M., the editor measured the angular diameter of the north cap to be 13° (pg. 13 of June issue). Neither value has been corrected for the tilt of the axis of Mars. The difference between the two values is probably without significance.

Mars is now very remote; by November 15 the angular diameter of the disc will have shrunk to 4″9. On the same date the south pole will be tipped toward the earth by three degrees; and quantity $\odot$, the heliocentric longitude of the planet so measured as to be 180° at the vernal equinox of the southern hemisphere, will be 218°. During the last month observations of Mars have arrived from S. Ebisawa (13-inch refl.), P. F. Froeschner (6-inch refl.), W. H. Haas (6-inch refl.), S. Murayama (8-inch refr., 8-inch refl.), T. Osawa (3-inch refl.), and D. O'Toole (6-inch refl.).

Only two of these observations were made in September, one by Haas on September 12 and the other by O'Toole on September 22. Haas found the south polar cap brighter and more conspicuous than the north cap; O'Toole made the south cap bright and conspicuous but did not distinguish a north cap at all. We might remember here that the vernal equinox of the southern hemisphere fell on September 12. Both observers found the south polar band very dark, as might be expected at this season. On his September 12 drawing Haas measured the diameter of each polar cap to be 35°; O'Toole measured the south cap to be 78° on his September 22 drawing. The Casius-Utopia shading was still notable to Haas, and O'Toole distinguished Propontis I and II as a pair of separate spots. O'Toole's rather uncertain impressions of color at C.M. 150° were black in the south polar band, white in the south cap, and gray or possibly brown in the dark markings.

Froeschner on May 14 drew a fairly small north cap bordered by a rather intense dark band. Syrtis Major was dark and prominent, although near the limb. (Compare to observations about a week later as given on pg. 12 of the July Strolling Astronomer.)

Mr. Osawa's drawings, which have been communicated by Mr. Tsuneo Saheki, are very remarkable for an aperture of only three inches. We have six drawings by this new colleague between April 30 and June 5, inclusive; he used a power of 200X. Osawa's little instrument was equal to such surprising feats as the separation of Lacus Niliacus from Mare Acidalium and the resolution of internal detail in Propontis and the Casius-Utopia shading. He found the north cap small, sharp, and brilliant; the surrounding polar band was wide, faint, and apparently diffuse. It is noteworthy that on June 3 at C.M. 262° Osawa found Syrtis Major and neighboring features almost obliterated by overlying Martian clouds, just as Saheki did in a simultaneous view. (See also pg. 12 of July issue and Figure 6 on pg. 1 of August issue.) Osawa saw a number of bright clouds, especially on the sunset limb; one on the limb at the equator on June 3 at C.M. 262° may have caused a slight bulge. On May 19 he drew Acidalium to be polygonal and represented Nilokeras then and on May 14 as a pair of canals converging at Lunae Lacus. Solis Lacus was fairly dark on May 14 at C.M. 92°. Elysium was drawn as a polygonal whitish area bounded by thin and faint canals.

S. Ebisawa has submitted a set of ten valuable drawings of Mars from May 24 to August 23. What are perhaps the best two of them are reproduced as Figures 7 and 8 on pg. 1. Ebisawa always found the north cap tiny and brilliant in his better views as late as July 5; it was so small that he could not estimate its angular diameter. Moreover, it was extremely small to Murayama on June 24. It may be of some significance that on July 7 Murayama thought the tiny cap less bright than on June 24 and noted a bluish white area (cloud?) around it; observing 15 minutes later on July 7, Ebisawa found the north cap indefinite, though in poor seeing. On July 24 and 25 and August 23 Ebisawa found the north cap rather dim and larger than before, as if it had become a cloud-cap. His results thus accord with those of Saheki, who also last saw a tiny and brilliant cap early in July. Murayama may be in more agreement with the curiously different American observations of the north cap during June-August. Writing on September 13, he said that he had seen the north cap sometimes very small and sometimes larger and that on August 12 a guest at the National Science Museum in Tokyo, who was observing Mars for the first time, perceived the then conspicuous north cap at once. On the whole, there is some evidence that the north cap became an atmospheric feature in July in the late summer of its hemisphere. From late May to late August Ebisawa and Murayama observed a diffuse south cap, which was sometimes brilliant and sometimes dim (Figures 7 and 8). Its color was white. It was more brilliant in July and August than in May and June, as might be expected with the approach of the southern spring. A faint south polar band appears to have been drawn once only, by Ebisawa on July 25. On May 24 Ebisawa saw with difficulty that Gehon was a double canal. Figure 7 shows the separation of Sinus Gomer from Mare Cimmerium observed by Ebisawa and Hare. In this same view Ebisawa suspected irregular detail in Elysium. Figure 8 shows the gradual diverging of Tritonilus and Deuteronilus canals to the east (right) of Ismenius Lacus and may be compared with Figure 5 on pg. 1 of our August issue, though this drawing be E. F. Hare was obtained when the planet was much closer. Murayama commented on the prominence of Acidalium on the small disc on June 24. Ebisawa's 13-inch reflector clearly resolved the two forks of Aryn, even when the angular diameter of Mars had decreased to 7".9 on June 30, and showed them to be darker than Sinus Sabaeus. He perceived Pandorae Fretum on July 5 as a faint band south of Sabaeus (Figure 8), and Portus Sigeus was apparently then seen as a pair of dark points on the north shore of Sabaeus (note also Figure 5 on pg. 1 of August issue).

THE LUNAR ECLIPSE OF OCTOBER 7, 1949

by Walter H. Haas
(continued from August issue)

It should be noticed from the date and year that we are not describing here the more recent lunar eclipse on September 26, 1950. It is known that a number of observations of this eclipse have not yet been reported; such observers are asked to send in their records at their early convenience.

ADDENDUM TO LUNAR METEOR SEARCHES

We learn from a letter from D. O'Toole on September 9 that P. Chorley watched the moon for possible lunar meteors or meteoritic impact-flares from about 2^h 20^m to about 3^h 24^m, U.T., using a 3.5-inch reflector at 60X. Chorley "observed several flashes"; but these cannot be identified with ones seen by others and listed on pg. 10 of our August issue, with one possible exception. At 3^h 18^m 30^s Chorley recorded a stationary flash perhaps about midway between Kepler and Euler. No descriptive notes are available. O'Toole suggests that Chorley may here have seen the object that Reed recorded west of Gassendi at 3^h 19^m, for coincidence in position and in time is certainly possible. The editor does not think that we have more here than a very intriguing possibility. To know that a lunar meteor has been observed in duplicate we must have agreement in exact time and precise location upon the moon, preferably further confirmed by agreement about brightness, color, direction of motion, etc. It is not enough to say that two poorly seen or inadequately described objects might be the same.

SEARCHES FOR ECLIPSE-CAUSED CHANGES

Our second principal observational program was the careful study of a number of apparently variable lunar regions to determine whether the passage of the earth's shadow affected them. This project required examining the areas chosen soon after they emerged from the umbral shadow and noting whether their appearance was then normal for the prevailing solar illumination. Some observers repeated these examinations at intervals for several hours. In addition to the usual sifting of observational evidence, nice judgement must be exercised here in deciding whether changes due to the eclipse are involved. When available, observations of the suspected region on the night before, and the night after, the eclipse are helpful in establishing the ordinary full-moon appearance. The same is true of observations in other lunations at the same solar lighting as on the night of the eclipse. Care must be exercised to avoid being deceived by the dim illumination of features deep in the penumbra or by normal changes with changing lighting near full moon. Observations of a suspected area soon before immersion in the umbra are obviously most useful in this program but could not be secured by most observers of the October 7 eclipse.

We list here those persons who watched for possible eclipse-caused changes, along with the telescopes and magnifications that they employed: D. P. Barcroft, 6-inch refl. at 98X; F. E. Brinckman, Jr., 6-inch refl. at 170X; W. H. Haas, 6-inch refl. at 141X; F. E. Hare, 7-inch refl. at 170X; L. T. Johnson, 10-inch refl. at 300X; R. C. Maag, 12-inch refr. at 150X; D. O'Toole, 6-inch refl. at 185X; the Messieurs Roques, 4-inch refr. at 152X; C. B. Stephenson, 6-inch refr. at 55X; and C. W. Tombaugh, 12-inch refl. at perhaps 200X.

It appears certain that at least one lunar feature was temporarily changed in appearance by the eclipse. We refer to the relative intensities of two dark areas in Eratosthenes, the one (hereafter called Area B) just east of the central mountains and the other (hereafter called Area C) east of B and of about the same size as B. It is normal for these two areas to be equally dark at the solar lighting which prevailed on October 7, the night of the eclipse. They were so observed by O'Toole and Haas in a number of views late in 1949 near full moon, including ones on October 6 and 8. On October 7, however, Haas was forcibly struck by the faintness of Area C relative to Area B soon after Eratosthenes reentered sunlight. It is his opinion that an eclipse-caused lightening of C caused this change and that B was not appreciably affected. Eratosthenes having left the umbra near $4^h\ 11^m$, U.T., Haas found C to be lighter than B by half a unit on the Standard Lunar Intensity Scale at $4^h\ 14^m$ and by a full unit at $4^h\ 28^m$. (The observation at $4^h\ 14^m$ is unreliable because of very dim penumbral lighting.) The difference, with C always the lighter, was three-fourths of a unit at $5^h\ 22^m$ but only one-fourth of a unit at $5^h\ 54^m$ and $6^h\ 29^m$. At $5^h\ 54^m$, in fact, Area C was explicitly noted to be darkening. From $7^h\ 6^m$ to $11^h\ 8^m$ C and B were always equally dark to Haas. Therefore, the eclipse-produced lightening of C (at least relative to B) lasted for about three hours. Near $4^h\ 22^m$ O'Toole agreed with Haas that B was darker than C. It should be noted that this change cannot be explained by penumbral lighting; it endured too long. The moon left the penumbra at $6^h\ 3^m$, and Eratosthenes was probably in full sunlight by $5^h\ 30^m$. Varying conditions of observation are also unable to explain the change, for Haas had fairly constant conditions from 5^h to past 10^h. It should be added that O'Toole and Haas found no worthwhile evidence that the eclipse affected several other dark areas in and near Eratosthenes watched by them, except that O'Toole suspected that a dark area just northwest of the central mountains extended farther west near $4^h\ 22^m$ on October 7 than on October 6 or 8.

The walled plain Grimaldi was observed by Barcroft, Haas, Hare, O'Toole, Stephenson, and Tombaugh. No changes were noticed in the darkness of the floor. Chief attention was given to three bright spots (really craterlets) which form a right-angled triangle near the northwest edge of Grimaldi, the right angle being at the southeast spot. Evidence that the eclipse caused a change in relative brightness of the southeast and the north spots is inconclusive. The western spot was at all times much the dimmest of the three and will not be mentioned further. Grimaldi left the umbra at about $3^h\ 41^m$. From $3^h\ 44^m$ to $5^h 50^m$ Haas found the north spot brighter than the southeast one by one-half to three-fourths of a unit on the Standard Lunar Intensity Scale. At $6^h\ 39^m$ the north spot was only one-fourth of a unit the brighter, and at $7^h\ 11^m$ they were equal. Continuing to observe, Haas found the southeast spot to be the brighter by half a unit from $7^h\ 54^m$ to $11^h\ 13^m$. Since he had found the southeast spot very definitely the brighter on October 6, Haas at first thought that the eclipse had caused it to be abnormally dim relative to the north spot for about four hours after Grimaldi emerged from the umbra. However, doubt is cast on this interpretation by the fact that Haas found the two spots equally bright on October 8, when the normal aspect had presumably returned. Hare found the southeast spot slightly the brighter from emersion to $5^h\ 33^m$, as also on October 8. The difference, he estimated, was not more than 0,2 or 0.3 magnitudes. Stephenson considered the northern spot to be perhaps slightly brighter than the southeastern one from $4^h\ 55^m$ to 6^h and obtained the same result on October 8. O'Toole at $3^h\ 50^m$ on October 7 made the north spot the brighter. By $5^h\ 15^m$ the southeast spot had become the brighter, an aspect also observed by him on October 6 and 8. O'Toole accordingly felt sure that the relative brightness at $3^h\ 50^m$ was abnormal and represented an effect of the eclipse.

The results of the different observers appear to be hopelessly contradictory, nor is it even clear what the normal appearance at full moon of the region is. Hare, O'Toole, and Haas observed the three Grimaldi spots near full moon in November and December, 1949, and in January, 1950, in attempts to establish this normal appearance but with uncertain success. Perhaps, indeed, the full-moon appearance varies from lunation to lunation. Alternately, the observers may have been attempting a feat that taxed the capabilities of their telescopes too much. Each of the three spots is really a tiny craterlet and varies considerably in brightness in its different parts. A reliable estimate of the average brightness may really be hard to make. If these spots are to be watched at future eclipses, we recommend that out-of-focus comparisons of their total light be made, rather than the direct estimates attempted here. It may also help to have good pre-immersion observations, which were lacking on October 7.

Maag, O'Toole, Stephenson, Tombaugh, and Haas watched the bright area around Linné, most of them comparing its size and brightness to those of other bright areas on Mare Serenitatis. The observers agree in finding no indication that the size, brightness, or sharpness of Linné was affected by the eclipse. One of the comparison spots (really a small crater) was unusually bright relative to other spots until about 7^h, or for about two and a half hours after Linné left the umbra, according to the observations of Haas.

Barcroft, Haas, Hare, Johnson, O'Toole, and Stephenson examined the Riccioli dark area, giving particular attention to the length and darkness of its south tip. This tip was found to look longest and darkest in the best views, as might be expected. Only O'Toole reported any possible effect of the eclipse upon Riccioli. He thinks that the south tip of the dark area lay a few miles farther south at $5^h\ 2^m$, and on October 8, than at $4^h\ 0^m$; however, the editor would propose that penumbral lighting at $4^h\ 0^m$ can explain this appearance.

Barcroft, Brinckman, O'Toole, Stephenson, and Tombaugh examined the famous walled-plain Plato. All these observers concluded that the eclipse did not influence the bright spots on the floor or its darkness. Their views were rather poor, no observer seeing more than three bright spots on the floor.

Hare, the Roques in France, Tombaugh, and Haas observed Atlas, Chief attention here being given to the two main dark areas on the floor and to the dark streak connecting them. Atlas was in the umbra from about $1^h\ 42^m$ to about $4^h\ 36^m$. There is some evidence that the connecting streak became more conspicuous for a while as a result of the eclipse. Haas found this streak to fade slowly but steadily from $6^h\ 7^m$ to $10^h\ 30^m$; the implication is that it was unusually dark from emersion to $6^h\ 7^m$. Observations by Haas on October 6 and 8, and also on December 5 at the same solar lighting as just after emersion, confirm that this streak was then more difficult to perceive than soon after emersion, thus supporting an eclipse-caused darkening. The Messieurs Roques found this connecting streak to be visible but rather indistinct from $0^h\ 30^m$ to immersion. After emersion it was not noticed until $4^h\ 45^m$, when it was recorded to be darker and much wider than before immersion. Our French colleagues here had the important advantage of having examined the region before immersion. A drawing by the Roques near $4^h\ 50^m$ suggests that the northwestern dark area was also enlarged after emersion. Observing after emersion, Tombaugh thought that Atlas showed its usual full-moon appearance. Hare could detect no change in the two dark areas and their connecting streak from emersion till $5^h\ 40^m$ nor upon October 8.

The rest of the observations can be quickly described. Conon was observed by Hare, Johnson, and Tombaugh, none of whom found any effect of the eclipse. Aristarchus was watched by Barcroft, Brinckman, and Haas, the first-named following it up to about 6^h; results were again negative. Hare alone observed Alphonsus, and O'Toole alone observed Fracastorius; neither object revealed any evidence of eclipse-caused changes.

(to be continued)

SECTION I
OF
H.P. WILKINS 300-INCH MAP OF THE MOON

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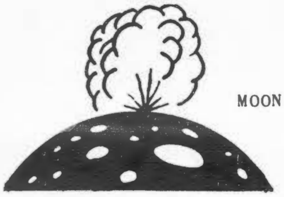
LIFE ON MARS

No one seems to have expected to see impact craters on Mars. Even the earth's largest crater would be much too small to be seen on Mars if it could be transferred. The largest meteorite pit on earth near Canyon Diablo in Arizona is only four thousand feet across. A circle this size on Mars would be invisible to the most keen-eyed observer. The largest lunar crater, however, is over 140 miles across. A Martian crater even half this size would be visible as a circle on Mars.

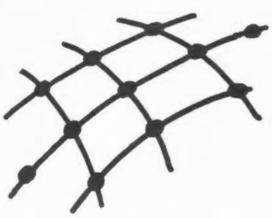


MOON CRATER EXPLOSION

The geometric and artificial appearance of the Martian network has made many persons skeptical of all observations of Mars. The network does reveal, however, that it is not an entirely artificial creation, but rather the adaptation of lines to a pre-existing natural arrangement of spots.

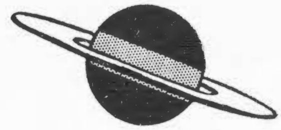
The very fact that the Martian oases are arranged haphazardly and at random shows that their position was not determined by intelligently directed effort. A consciously designed network is far more likely to embody simplicity than complexity. The most efficient network adapted to random impact craters must have developed by trial and error.

CONSCIOUSLY DESIGNED NETWORK



Meteorite craters are known on the earth and moon; therefore, craters exist on Mars. The circular oases on Mars are the size, shape, and number of comparable lunar craters.

Crater depressions form a natural reservoir, accounting for the intense vegetation in the Martian oases. The random distribution of crater oases is apparent, indicating that the canal system was adapted to this haphazard arrangement.



SATURN HAS RINGS

Saturn's rings have the dazzling brightness of snow. The difficulty in explaining this brilliance with ordinary materials has led some observers to suggest that the rings of Saturn are indeed composed of snow-like particles. P. H. Hepburn, a British astronomer, championed this view in 1920 when he suggested that Saturn's rings were similar to our own cirrus clouds of ice crystals.

The snowy white brightness of Saturn's rings cannot be explained by ordinary meteoritic fragments. Optical dust is likewise inadequate as an explanation, because radiation pressure would disperse microscopic particles into space. Some white substance such as snow is indicated to explain the ring reflectivity.

CENTRAL BELT ONLY

NEW CENTRAL BELT

PARALLEL BANDS

COMPLETE CANOPY

The central band of Saturn has shown a gradual change in period due to the conservation of momentum received from falling ring particles. Saturn's cloud belts consist of fallen ring particles rotating as a canopy at the extreme edge of Saturn's atmosphere. Canopy particles are precipitated to the planet core from the polar region.

Rings were formed by condensation from the original atmosphere of Saturn. A flat ring can be formed only in an atmosphere. The satellite-disruption theory cannot explain the flatness of the ring, nor the brightness of ring material.

LAST ICE AGE

The annular theory explains geologic glaciations by assuming that the earth once had a ring system similar to that of the planet Saturn. The fall of such a ring system formed a canopy of cloud belts similar to those on the planet Jupiter.

Precipitation from such a cloud canopy on the earth accounts for the distribution of glaciation during the Pleistocene. The area of greatest accumulation of ice appears to have been between latitudes 50 to 70 degrees with maximum glaciation at about 60 degrees. Canopy flakes precipitating in this zone adequately account for the simultaneous occurrence of glaciation in the northern and southern hemispheres. Successful explanation of the last ice epoch implies that all antecedent glacial epochs can be accounted for by the annular theory.

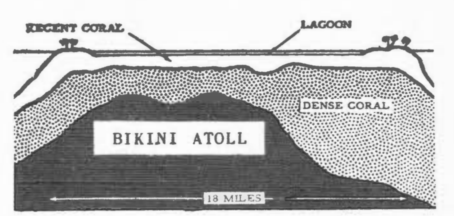
GLACIAL EPOCH BEGINS

MAXIMUM OF LAST GLACIAL EPOCH

GLACIAL EPOCH ENDS

RECENT PERIOD BEGINS

A permanent rise in the ocean level is required as a corollary to the theory of canopy glaciation. The quantity of water added to the ocean is shown to be related to the volume of canopy glaciation, to the amount of oceanic chilling, to the decrease in salinity of the ocean, to the depth of submerged river canyons, and to the reflective layer in the coral of Bikini Atoll.



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Beginning with the discussion of craters on the earth and on the moon, Mr. Cyr demonstrates that the Martian oases, those round dark spots at the intersections of 'canals' are really meteoric pits. The chief issue which must be settled is whether or not the markings on the planet are thin straight lines, grouped into elaborate networks; for upon this issue turns the enigma of intelligent life on Mars. E.B.B.

Washington, D. C.
Found your book intensely interesting and stimulating. After 40 years of study of meteor craters on the earth and moon, it never occurred to us that Mars *must* have them too and that they are visible. Lt. Col.B.B.

SMITHSONIAN SOLAR OBSERVATORY, Calama, Chile, S.A.

Although quite revolutionary, your hypothesis for the most part sounds very reasonable. I am frank to admit that neither of the old theories of Saturn's rings have clicked very strongly with me and for this reason I was especially interested in the excellent points which you brought out. A.F.M.

Monrovia, California
Your presentation of your ideas is superlatively good. Not that I agree with all your conclusions, but you are distinctly on the right road. A.M.B.

Campbell, California
Just finished reading the 'Last Ice Age' and enjoyed it from beginning to end. W.A.S.

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