The Strolling Astronomer

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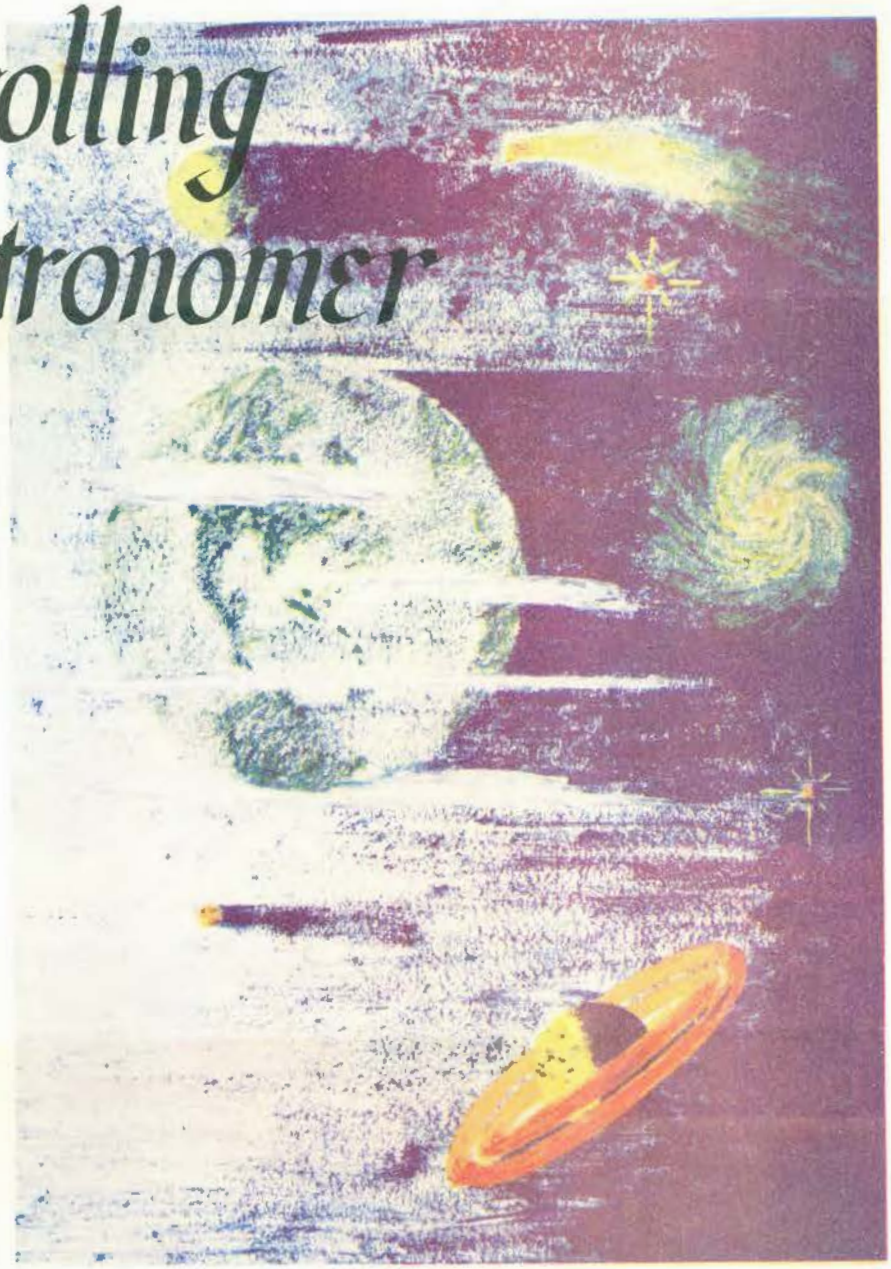
ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS



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NOTICE: In order to facilitate the reproduction of drawings in future issues, readers are requested to exaggerate contrasts on drawings submitted. Extremely faint marks cannot be reproduced. Outlines of planetary discs should be made dark and distinct. It is not feasible to reproduce drawings made in colors. Following these precepts will permit better reproductions.

Figure 1. Photograph of Mars with Lowell Observatory 24-inch refr. July 13, 1939. 9^h,U.T. C.M. = 341°.

Figure 2. Mars.
T. Saheki. 8-inch refl.
330X. Oct. 17, 1951.
21^h 5^m, U.T. C.M. = 185°

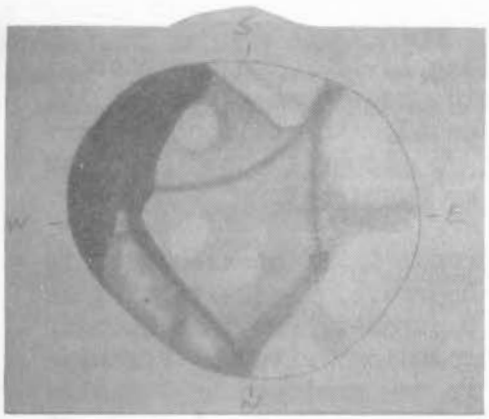

Figure 3. Lunar Crater Conon.
E. J. Reese. 6-inch refl.
240X. May 16, 1951. 4^h 30^m,U.T.
Colong. = 30°.7

Figure 4. Lunar Crater Conon.
L. T. Johnson. 10-inch refl.
221X, 300X.
May 16, 1951. 2^h 0^m, U.T.
Colong. = 29°.4

Lunar Drawings by H. G. Allen. 3.5-inch refl., 200X.

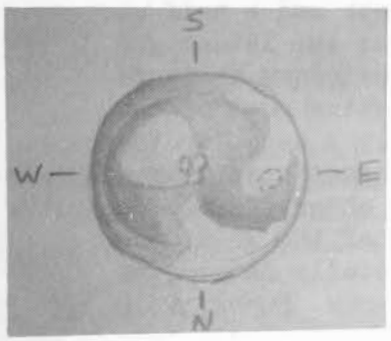

Figure 5. Eratosthenes
May 17, 1951. 3^h30^m,U.T.
Colong. = 42°.4

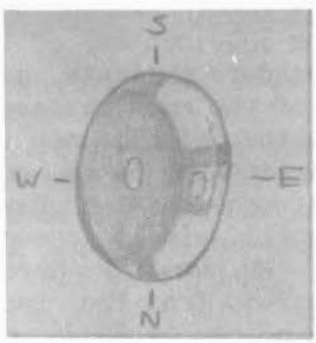

Figure 6. Aristarchus
October 14, 1951.
2^h 50^m,U.T. Colong. = 73°.8

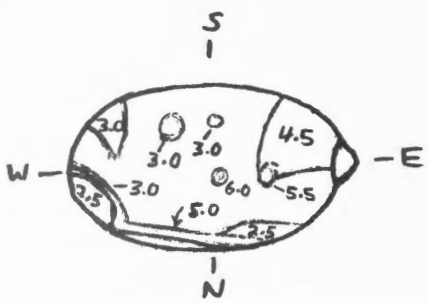

Figure 7. Plato
October 14, 1951.
2^h 30^m, U.T.
Colong. = 73°.7

SEASON'S GREETINGS

THE STAFF OF THE STROLLING ASTRONOMER WISHES TO ALL ITS READERS AND FRIENDS A VERY MERRY CHRISTMAS AND A VERY HAPPY NEW YEAR. WE THANK YOU FOR YOUR SUPPORT AND ASSISTANCE IN OUR EFFORT TO PROMOTE LUNAR AND PLANETARY ASTRONOMY AND, WITH YOUR CONTINUING AID, SHALL ENDEAVOR TO BRING YOU A BETTER MAGAZINE IN 1952.

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ANNOUNCEMENTS

Errata in November, 1951, Issue. On pg. 3, lines 14-15, the secretarial address of the British Interplanetary Society should have been given as 157 Friary Road, London, S.E. 15, England. On pg. 6, line 43, the editor's observation was on September 19, 1940 (not 1950). On pg. 9, lines 19 and 22, the name of the French astronomer should have been given as **Quenisset**.

New Address of Ernest L. Pfannenschmidt. Mr. Ernest L. Pfannenschmidt, in recent years an active leader of European planetary observers, requests that we announce his new address; it is Staff House, Room 2, Duparquet, Province Quebec, Canada. All A.L.P.O. members who have been corresponding with Mr. Pfannenschmidt should use this new address. Our colleague is now employed by Consolidated Beattie Gold Mines, Ltd. and plans to resume active astronomical work at his new location as soon as possible.

David W. Rosebrugh Honored. One of our A.L.P.O. members, Mr. David W. Rosebrugh, was signally honored at the Fortieth Anniversary Dinner of the American Association of Variable Star Observers, held on October 13, 1951, at Harvard College Observatory, Cambridge, Massachusetts. He was given the Association's Merit Award, the eleventh awarded in 40 years, for his observational work on variable stars and the sun and his administrative services to the A.A.V.S.O. as former secretary and president.

We heartily congratulate Mr. Rosebrugh upon a rare distinction which he has richly earned! We are naturally proud of the fact that he has been an active supporter of the A.L.P.O. since its beginning.

Availability of Elger Map of the Moon. During the last year and a half we have spoken much of the H. P. Wilkins 300-inch map of the moon as the latest and best of lunar maps. Letters from readers indicate, however; that some amateurs still desire a small, one-piece map of the moon, necessarily lacking most of the detail on the Wilkins map. Indeed, the Wilkins map is scarcely a map for the beginner or one for easy use in learning the names of lunar formations; it represents the cooperative studies of some of the best lunar observers of our time. For those who instead need a small, simple, one-piece map of the moon, the one by T. G. Elger is very useful. Mr. David P. Barcroft helpfully informs us that the Elger map can now be purchased from the Eastern Science Supply Co., P. O. Box 1414, Boston, Mass. The price is $2.25 postpaid for a single map. The moon's diameter on the map is 18 inches. The editor has found the Elger map

helpful in his lunar studies as a good general map of the moon ever since he acquired a copy 16 years ago and recommends it to others.

Foreword by Editor. Mr. David W. Rosebrugh, A.A.V.S.O. Merit Award Winner, has contributed a third interesting and important article on the limits of visibility of artificial planet-like detail. This subject is one of paramount interest to all serious lunarians and planetarians, for in interpreting our observations we must constantly keep aware of the necessary limitations of our instruments. We would hence underscore Mr. Rosebrugh's invitation to other A.L.P.O. members to repeat his tests and to report their results. Some may wish to refine the tests so as to simulate more closely the actual conditions of our telescopic observations of planets. Obvious improvements toward greater realism would be to draw the artificial detail on the surface of a sphere, to illuminate the sphere from a distant light-source to simulate the sun's illumination of a planet, and to view the detail through a tube to imitate the limited telescopic field of view. However, even the very simplest experiments will be of interest and are actually badly needed in our studies.

Mr. Rosebrugh's address is 70 Waterville St., Waterbury 10, Connecticut.

VISIBILITY OF PLANETARY DETAILS

by D. W. Rosebrugh

In the May, 1950, issue of The Strolling Astronomer I presented the results of my naked eye tests of the visibilities of thin wires of different colors against different backgrounds. In the January, 1951, issue were given the results of tests made on the separability and visibility of small circles of paper ("planetary details") of different colors against various colored backgrounds. These naked eye tests were tied in with Dawes' Limit by a separate experiment.

Mr. Walter H. Haas, Director, A.L.P.O. has suggested that naked eye experiments should be made of the separability of parallel lines. Such tests may have a bearing upon the separability of double Martian canals, if they exist, and on the separability of various belts on Jupiter.

A separate test has been made using a schematic sketch of Cassini's Division, lying between Rings A and B of Saturn to determine the minimum apparent arc it can have and still be visible.

General Description of Tests

The tests were made on Sept. 9, 1951, from 9 to 10 A.M. E.S.T., Sept. 15 from 3:55 to 4:15 P.M., and Sept. 16 from 10:15 to 10:45 A.M. These were days of good to excellent seeing as shown by solar observations. The sketches which were used were placed in a vertical plane in full sunlight, facing the sun; and I stood with my back to the sun so that my shadow stretched towards the sketches. All observations were made with the right eye only. Distances were measured with a surveyor's tape. All tests were made with the lines in a horizontal position and repeated with them in a vertical position. In a general sort of way the details were visible at about 3% greater distance when the lines were in the vertical position than when in the horizontal position. This probably corresponds to a little uncorrected astigmatism in my eye. The greatest distances at which the

details could just be seen were jotted down. Some consideration was given to using the distances at which the details could be seen well, but it was concluded that the distances at which the details could just be seen were more accurately determinable. All tests were made two or more times and averaged.

Test Made on Sketch of Cassini's Division

In the June, 1949, issue of The Strolling Astronomer, page 2, paragraph 1, the editorial comment is made upon the observations by A.L.P.O. observers of Cassini's Division and other narrow black details on Saturn: "There can remain little doubt that a black band of breadth 0."1 is readily visible in 6-to 10-inch telescopes." (Powers used not stated; let us assume 300X.)

A schematic sketch (Figure 2 on pg. 5) was made to scale showing Ring A, Cassini's Division, Ring B, and a suggestion of the Crepe Ring C in front of the ball. Russell, Dugan and Stewart in their Astronomy give the widths as follows: Ring A, 10,000 miles; Cassini's Division, 3000 miles; Ring B 16,000 miles; division between B and C 1,000 miles; Crepe Ring C 11,500 miles. In the sketch Cassini's Division was drawn 0.05 inches wide and the widths of Rings A and B in proportion. "Cassini's Division" could be detected with my naked eye at a distance of 40.2 feet, corresponding to an angular width of 21.4 seconds. If we assume that this is looked at telescopically with a power of 300X "Cassini's Division" should be visible when it subtends an angle of 21.4/300 or 0."071 of arc. This compares with the figure of 0."1 quoted above. The agreement, while not exact, is extremely gratifying and bolsters the writer's opinion of the general validity of his naked eye experiments when transferred to planetary study.

The writer would be the last to maintain that any of his naked eye results can be applied exactly to his own results at the telescope or to the results of others who may have keener eyesight than he has. Perhaps a "factory of safety", as engineers say, should be applied when one is looking through the telescope to allow for unsteadiness of the seeing, poor transparency, and telescopic aberrations, and more particularly in the case of Mars to allow for the fact that its markings are probably not as sharply delineated as the sketches which the writer has used; but all available evidence seems to reinforce the writer's belief that the results of naked eye tests of drawings and models are at least a guide to what one can expect to see on the planets with a telescope.

Description of Tests on Separability of Parallel Lines

After reviewing the results of the earlier tests (Strolling Astronomer, May, 1950, and January, 1951) on the visibility of thin wires and artificial planetary details it was decided to use a buff paper background on which were drawn lines in black, brown, and green ink, as it was concluded that these colors were reasonably representative of the previous tests, made with a greater variety of colors and backgrounds.

As a "control", to tie in with the earlier experiments on the visibility of fine lines, three lines seven inches long, and 0.05 inches wide were drawn in black, brown, and green ink. These were widely separated on the buff paper background.

To test for the separability of lines, two lines 3 inches long and 0.05 inches wide with a 0.1 inch spacing, center to center, were drawn. There was

Figure 1. Visibility of Details on Mars. See Article by D. W. Rosebrugh in this Issue.

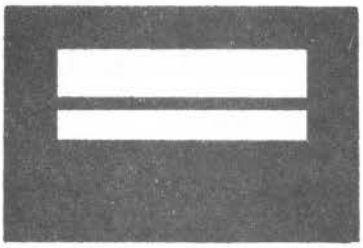


Figure 2. Schematic sketch of rings of Saturn. See Article by D. W. Rosebrugh in this Issue.

thus 0.05 inches of buff paper background between each line. Such pairs of parallel lines were drawn in black, brown and green ink. Each pair of lines was widely separated from the other pairs of different color.

Let us look at the "controls" first. From Table B in the May, 1950, issue the figures for the visibility of black, brown, and green colored wires against a buff background have been copies to compare against the ink lines drawn on the buff paper in this experiment.

Width in Seconds at Which Lines Are Just Visible
Against a Buff Background

	Wires May 1950	Ink Lines Sept. 1951
Black	5.5	7.7
Brown	5.8	8.1
Green	5.8	10.5

It is disappointing that the agreement is not closer, but of course while the principles are the same in each case, the details are very different. In particular the green ink was so thin-bodied that some of the buff background was visible through it. However, the agreement is close enough so that one can say at least that the tests are fairly comparable with each other.

The results of the tests on separability are as follows:

Separation in Seconds, Center to Center, At Which
Two Parallel Lines Are Seen As Two Lines Than As One

Black Lines	96.9
Brown Lines	96.9
Green Lines	96.9

Note: Spacing between lines was 0.05 inches, but center to center spacing was 0.1 inches and was used in above computation.

Similar tests were also made with bundles of 5 parallel lines, as perhaps representing Jovian belts better than the two-line drawings.

The results of these tests were:

Separation in Seconds, Center to Center, at Which Five
Parallel Lines Are Seen as Five Lines Rather Than as One

Black Lines	83.0
Brown Lines	83.0
Green Lines	92.3

Note: Spacing between lines was 0.05 inches, but center to center spacing was 0.1 inch and was used in above computation.

Application of Test Results

The results of these tests, as was the case in the earlier experiments, can be transferred directly to Mars at the time its disc subtends 14 seconds of arc, using a telescope of 300X, by remembering that one mile on the disc of Mars appears one second wide in the telescope field under these conditions. The proof of this is simple. The cotangent of 1 second is 206,265. That is, a mile at a distance of 206,265 miles subtends 1 second of arc. At 300 times this distance, namely 61,879,500 miles, 300 miles would subtend 1 second of arc. As Mars is 4205 miles in diameter it would subtend 14 seconds of arc if at 61,879,500 miles distance; and if magnified 300 times, Mars would appear to be 4200 seconds in diameter in the telescope. Hence one mile on Mars' surface at the sub-earth point subtends an apparent angle of 1 second in the telescope field.

From the above tests we can conclude, therefore, that two parallel lines on the surface of Mars would have to be 97 miles apart, center to center, to be separable at 300X.

Extending our figures to Jupiter at an assumed distance of $6\frac{1}{2}$ times as great, or 402,216,750 miles we may conclude that two belts of equal width and intensity would have to be 630 miles apart, center to center, to be separable; but five equally spaced belts of equal width and density, if such existed, could be as close together, center to center, as 540 to 600 miles and still be separable at 300X.

Conclusions

From our tests reported in the May, 1950, January, 1951, and this present issue of The Strolling Astronomer we now can compile a composite picture of Mars showing what the writer believes are the smallest details which he could detect with a 6" telescope using 300X. In practice a "factor of safety" should be applied to these figures, no doubt.

This composite picture of Mars is shown on Figure 1 on pg. 5. The disc is 4.2 inches in diameter, and if viewed from a distance of 17.2 feet, it will subtend an arc of 4200 seconds at the eye, corresponding to Mars at a distance of 61,879,500 miles if viewed with a telescope using 300X. On this scale 0.9 inches equals 900 miles, 900 seconds of apparent arc, and 3 seconds of real arc on Mars.

As this sketch is black and white but represents dimensionally the averaged results of tests made in many colors, it is not to be expected that if one looks at this sketch from 17.2 feet that all the details shown will disappear simultaneously, though an actual test made by placing the original drawing in bright sun shows that the sketch, even though it is black and white, represents color conditions fairly closely.

The details inside the disc of Mars are as follows, reading from the top:

Open circle 0.102 inches in diameter. This circle represents the minimum size (102 miles in diameter) of an object on Mars whose color can be detected. Smaller areas will appear grey in color. Small black dot 0.043 inches in diameter. This dot represents the minimum size (43 miles in diameter) of a round detail on Mars which can be seen. Smaller areas will be invisible.

Two black circles 0.101 inches in diameter and 0.203 inches center to center. These circles represent the minimum spacing (203 miles center to center) of two round details on Mars which can be seen as separate entities. Objects closer together will appear as one. Horizontal line 0.008 inches wide. This represents the narrowest line (8 miles in breadth) which can be seen on Mars. Narrower lines will be invisible. Two lines each 0.048 inches wide, spaced 0.097 inches center to center. These represent the closest spacing (97 miles center to center)of two lines each 48 miles wide which can be separated on Mars. Lines which lie closer together than 97 miles center to center will appear as one line.

And now, fellow planetarians, please make your own tests and let me know what you find. If I receive enough data it will perhaps be possible to form a combined picture of what others see as well as myself, and a paper can be prepared for The Strolling Astronomer giving the combined findings of a number of members of the A.L.P.O.

VENUS TO AND BEYOND INFERIOR CONJUNCTION IN 1951

by James C. Bartlett, Jr.

The writer would like to take this opportunity to pay a brief and well-deserved tribute to the work of Mr. T. R. Cave, Jr., our former Venus Recorder, whose last report appeared in the September issue of The Strolling Astronomer. Mr. Cave served us well; and the present Recorder can do no better than to follow the concise and logical system of presentation which the former introduced. The organization and presentation of Venus material was no mean task; but Mr. Cave carried it out with conspicuous success, and this despite the pressure of every day affairs which must have been considerable. The current writer will try to do as well; but should he falter here or there, he invites the observers to have at him with whatever bludgeons may come to hand. Meantime we of the Venus Section can only say: "Thank you, Mr. Cave, for a notable piece of work".

Recent observations have been received from Thomas Cragg (6-in. refl.); C. M. Cyrus (10-inch refl.);W. H. Haas (6-inch refl.);T. E. Howe (4-inch refl.); Lyle T. Johnson (10-inch refl.); T. Osawa (6-inch refl.); O. C. Ranck (4-inch refr.), C. B. Stephenson (18.5-inch refr.), and J. C. Bartlett, Jr. (3.5-inch refl.). In addition W. H. Haas has contributed observations made atop Mt. Palomar, on the occasion of the recent Third Annual Convention of Western Amateurs, covering work by T. R. Cave, Jr.; T. A. Cragg; E. Epstein; M. Golub; W. H. Haas; C. C. Post; and R. Scharer. Interesting notes are also at hand from R. M. Baum and M.B.B. Heath.

The Cusp Caps. May 25th, 1951, $3^h\ 05^m$ (U.T. here and later) Cragg saw the S. cusp-cap faintly visible on the dark side. Two things may be noticed: The dark side was visible; and the S. cusp-cap was independently visible against it. We thus have supporting evidence for earlier observations of Haas on the existence of local brighter areas within the dark hemisphere. On June 12th, 1951, at $3^h\ 10^m$, Cragg saw both cusp-caps so projected though on this occasion he found the dark side brighter than the sky whereas it had been darker on May 25th.

R. M. Baum contributes an equally unique Venus observation. This industrious observer - 180 drawings of Venus from February 3rd to May 7th - has reported "a curious mottling of the S polar cap (i.e. the S. cusp-cap)" which was "like a myriad of scintillating star-like points". Unfortunately date of observation is not given.

One here thinks of the similar flashes occasionally seen along the Martian polar caps, and which have been reasonably attributed to reflections from icebergs or ice pinnacles. The Venusian phenomenon sounds more like flocculent cloud similar to alto- or cirro-cumulus, though the possibility of ice caps at the Venusian poles is by no means ruled out by the relatively high temperature. Temperature is profoundly modified by altitude, as witness perpetual snow caps on the equatorial mountains of Africa; and the Recorder feels that there is good evidence for the existence of a high plateau at the South cusp of Venus. Whether the S. cusp corresponds to the S. pole of rotation is another matter; though the writer strongly believes that such is the case, a view evidently adopted by Baum and favored by Cragg. In a subsequent, illustrated report, this matter will be considered more fully.

Cragg found both cusp-caps to vary in visibility and prominence from May 25th to June 25th, though the S. cusp was generally the more prominent. This is generally confirmed by Bartlett, who also found both cusp-caps to vary in brilliance and apparent size though the S. cusp-cap remained, on the whole, the larger and brighter. C. M. Cyrus, June 12th, $0^h\ 35^m$, drew the N. cusp-cap but not the S. cusp-cap; and on July 15th, $0^h\ 45^m$, Cyrus drew both but noted that the N. cusp was the brighter. Basing his ideas on the observed movement of bright areas at both cusps, the Recorder is of the opinion that these variations are probably to be referred to the effects of moving cloud masses.

The Disc Markings. Discussion of these will be deferred to a later paper, when it is planned to present an illustrated report dealing entirely with the dusky and bright markings, of which many observations were made by A.L.P.O. members.

The Dark Side. An important number of observations were secured of one of the most interesting of Venusian phenomena, the visibility of the dark side. From May 25th to June 25th, Cragg saw the dark side eight times. From May 13th to August 4th, Bartlett saw it seventeen times. Haas, Post, Cave, Epstein, Golub, and Scharer also observed the phenomenon. Both Cragg and Bartlett found it to be sometimes darker, sometimes brighter, than the sky.

The possibility that the visibility of the dark hemisphere is purely an optical phenomenon, or illusion, is (in the opinion of the Recorder) not likely. If illusionary, depending upon the ratio of illuminated to dark surface plus suggestion, would suppose that after dichotomy to inferior conjunction it would be consistently visible. Such is not the case. Both Cragg and Bartlett observed it before dichotomy, i.e. when the phase was gibbous; and both found it to vary irregularly in visibility after dichotomy. For example, September 20th, Cragg found the dark side invisible on the thin morning crescent. Bartlett found it sometimes visible, sometimes invisible, in August, before inferior conjunction.

The question of the time when the dark side first becomes visible is of considerable theoretical interest. Based on personal observations, this would

seem to vary through rather wide limits. In 1948, the writer first saw the dark side when the value of the Ephemeris k was 0.509, i.e. almost precisely at theoretical dichotomy; but in 1949 it became visible when k equalled 0.625; and in 1951, when k was 0.701. It will be noticed in regard to the last figure that the dark side was seen though 70% of the disc was illuminated; yet on September 20th, 1951, when the dark hemisphere occupied some 92% of the disc it was invisible to Cragg. This does not suggest that its appearance is always and wholly illusionary.

The occasional appearance of color on the dark side, and of color which may be confirmed by filters, is also suggestive of a real and measurable phenomenon. Marked color is, however, rare. Cragg does not mention color in his recent views of the dark side and the writer saw no color in seventeen appearances, though in other years a coppery to purplish hue has been noted.

This fact, taken with the fact that the dark side sometimes appears darker, sometimes brighter, than the sky, would strongly indicate that the phenomenon arises independently from time to time from two distinct causes; from projection and from radiation. Whether the dark side will appear darker or brighter than the sky will, in this view, depend upon which cause is operating at the time. Occasionally, both causes may operate simultaneously.

It should be clearly understood that projection does not necessarily imply a background brighter than the sky, but only one brighter than the projected hemisphere of the planet. The most probable such background would be a streamer of the solar corona. This would ordinarily be invisible in the sky because the sky is locally brighter; but it is clear that a planetary body in space, and therefore outside the earth's illuminated atmosphere, could be seen in silhouette against it. Such a silhouette would be both darker than the sky and blackish, a very common appearance of the dark side in the 1951 evening apparition of Venus.

In this connection it must be remarked that the shape and extent of the corona vary markedly with the state of the sunspot cycle. The variations are such that at times of sunspot maximum the corona is smaller and much more symmetrical with respect to the solar disc than at times of sunspot minimum. During the minimum phase, however, the corona is frequently characterized by equatorial streamers of enormous extension.

According to the Solar Division Bulletin of the A.A.V.S.O., the sunspot minimum period officially began December 19th, 1950, though a definite decrease in spot activity was observed as far back as 1949. Accordingly, by the spring of '51 the sun had fairly entered upon its minimum period; and hence visibility of the dark side of Venus by projection became increasingly probable. This was especially true as Venus approached inferior conjunction, because its angular distance from the sun decreased proportionately.

The Recorder would like to point out that we now have a means to test the hypothesis of projection, largely denied earlier observers. It is now possible to record the shape and extent of the corona every clear day of the year by means of the coronograph, when this instrument is mounted at a suitable location. Such a record is presently being compiled at the Climax station of the Harvard College Observatory. If A.L.P.O. observers will but keep a careful and complete

record of all appearances of the dark side of Venus, eventually sufficient data will be at hand to enable direct correlation to be attempted.

The probability of an actual radiation from the dark side may likewise be tested against a different standard; namely, the disturbed condition of the sun as manifested by spot activity which in turn is reflected in higher Wolf numbers. Marked electromagnetic effects are manifested on the earth, including extensive aurorae, during times of maximum spot activity; and it is entirely reasonable to suppose that at the lesser distance of Venus from the sun such effects would be more intense. Unfortunately, though solar data are abundant the record of dark-side appearances of Venus in the past is so incomplete and fragmentary that no useful comparison is possible which again urges us to more complete records for the future. At any rate if the theoretical views here expressed are tenable, we might expect the dark side to appear most often brighter than the sky, and to exhibit more frequent color, during a sunspot maximum and to appear most often darker than the sky, and to average black, during a sunspot minimum. There is certainly an indication that such was the case in the 1951 evening apparition of Venus.

Mention may here be made of Haas' phenomenon, i.e. an unequal illumination of the dark side, first reported by W. H. Haas in The Strolling Astronomer, Vol. 4, No. 1. June 17th, 1951, at $0^h\ 08^m$, the writer observed a distinctly darker lune of the dark side which lay adjacent to the terminator. We may suppose that the dark side was partly self-luminous for some distance inward from the dark limb. The darker lune would then be that region to which this illumination did not extend. The same phenomenon was again seen by the writer on June 25th at $0^h\ 28^m$, though on this date the darker lune was much broader. On the same date, but at $2^h\ 05^m$, Cragg merely reported that the dark side appeared darker than the sky.

On June 12th, at $3^h\ 10^m$, Cragg made a remarkable observation. He noted that the dark side was "easily seen" but brighterthan the sky, and at that time he distinctly saw the continuation of a dark belt-like marking into the dark side and almost to the dark limb. This important observation was made with a 6" reflector at 104X. So far as the Recorder is aware, this observation may be unique. No comparison observations are at hand for this date.

The Illuminated Atmosphere. On August 16th, 1951, W. H. Haas, using C. J. Chrones' 6" refl., T. R. Cave's 6" refl., and R. Weitbrecht's 5" refr. at powers ranging from 150X to 300X, found that the horns of the crescent extended through an angular perimeter of 280° 40° maximum possible error. Haas found the dark side visible and darker than the sky but also found it progressively brighter from the terminator to the dark limb. C. C. Post, T. R. Cave, T. A. Cragg, E. Epstein, M. Golub, and R. Scharer, among others, confirmed both the visibility of the dark side and the prolongation of the horns of the crescent. A few persons thought the ring of light to extend completely through 360°. Perhaps 270° was a good mean estimate. These observations were made atop Mt. Palomar on the occasion of the Third Convention of Western Amateur Astronomers.

C. B. Stephenson, using the 18"5 refr. of Dearborn Observatory, at about 190X, observed Venus on September 3rd, 1951, from $16^h\ 15^m$ to $18^h\ 15^m$. Heliocentric longitude equalled 340°, and i (angle between sun and earth as seen from the planet) equalled 167°. Seeing was rapidly variable, ranging from 1 to 5 on

the 0 to 10 scale "with the best views seldom lasting more than five seconds". Stephenson had a thin haze, with transparency varying from 3 to 4 on the 0 to 5 scale.

He writes that "in the best moments definite glimpses were obtained of faint extensions of the cusps, making the limb perimeter of the thin crescent greater than 180°. The exact limit of the cusps was impossible to ascertain; the limb perimeter was estimated to be 220°- 20°. At times the north extension, and at other times the south extension, seemed to be the easier of the two to see; the overall impression gained was that the extensions were quite symmetrical with respect to the peri-solar point of the limb....".

These are the only observations of the illuminated atmosphere at hand. W. H. Haas had at the last moment proposed to the Chapel Hill Convention of the A.L. that observations of Venus be made on September 3rd but in a letter to the Recorder, Mr. Lyle T. Johnson (who attended the Convention) explained that for reasons of time such observations were not found feasible.

A single, anomalous observation by the writer may be mentioned though it is certain that the phenomenon must be referred to some cause other than direct solar illumination of the atmosphere. June 24th, at $0^h\ 28^m$, T5, S7, 3.5 in. refl. at 100X., the entire 180° of the dark limb was found to be faintly illuminated, or at least brighter than the dark side which itself was faintly visible. About 6° from the terminator on the south a brighter arc of this limb illumination was found, about 10° in extent. It greatly resembled local brightenings on the dark limb of the moon, recently observed by Saheki, Murayama, and the writer (The Strolling Astronomer, vol. 4, no. 4, p.7; and vol. 4, no. 10, p. 8).

Postscript by Editor. Dr. Bartlett has indeed maintained the quality of Mr. Cave's Venus Reports. His proposals for correlating dark side appearances with the solar cycle are especially good; and if only A.L.P.O. members will make an intensive study of the visibility and appearance of the dark hemisphere during the next ten years or so, we shall then have excellent data for deciding whether we see the dark hemisphere because of silhouetting, because of Venusian atmospheric radiation, or because of both. Mr. T. A. Cragg wrote on June 26, 1951, that he was finding the dark hemisphere of Venus to be darker than a daytime sky but brighter than a night sky. He was attempting to determine at what time (in the twilight) the change took place. Such an experiment would appear to possess considerable importance; but if we accept merely his report that the dark hemisphere was brighter than a sufficiently dark terrestrial sky-background, we have conclusive proof that the phenomenon cannot be wholly explained by the silhouetting of Venus against a brighter background but must arise at least partly on the planet itself. Cragg's experiment should certainly be repeated in the future, and it would be excellent if photography could be employed.

Venus will be well placed in the morning sky during December and will still be observable to advantage during January. All readers able to observe it are urged to do so and to report their results.

OBSERVATIONS AND COMMENTS

Figure 1 on pg. 1 is reproduced with the kind permission of the Lowell Observatory. This photograph was secured with the Lowell 24-inch refractor and a

red 3F Plate, the print used for this reproduction having been kindly given to the editor by Mr. Clyde W. Tombaugh. This photograph is not necessarily representative of the best Lowell work in 1939. It was taken when the angular diameter of Mars was 23".2, when the south pole was tipped 9 degrees toward the earth, and when quantity ☉ was 205° so that the Martian season was almost a month after the vernal equinox of the southern hemisphere. A number of features can be identified by comparing Figure 1 to maps of Mars; one readily finds Syrtis Major, Sinus Sabaeus, the forks of Aryn, Margaritifer Sinus, Mare Erythreum, Mare Acidalium, Hellespontus, and Deucalionis-Noachis. On the editor's print, though perhaps not on Figure 1 since some loss of detail in reproduction is inevitable, the oasis Oxia Palus is revealed at the pointed north tip of Margaritifer Sinus - sufficient evidence of good photographic definition. The south cap was large and brilliant at this Martian season; of the north cap there is little or no trace.

Mr. Tsuneo Saheki of Osaka, Japan, is already active upon the just-beginning 1951-2 apparition of Mars, and Figure 2 on pg. 1 is one of his drawings. On the date of his observation, October 17, the angular diameter was only 4".3, the north pole was tipped toward the earth by 23 degrees, and quantity ☉ was 44° so that it was the middle of spring in the northern hemisphere. As might have been expected at this season, the north polar cap was large and brilliant and was surrounded by an intensely dark "melt band". Hesperia was very brilliant; and in this connection it is interesting that Hesperia had looked bright and whitish yellow to Saheki on October 6, while Osawa had remarked a bright region between Syrtis Major and Sinus Gomer on October 9. Saheki tentatively identifies the intensely dark streak, to which the lower arrow on Figure 2 points, as Pactalus canal; he had perceived no trace of this marking on October 5 and 10. It will be noticed that Mare Serenum is considerably darker than Mare Cimmerium on Figure 2, possibly because of Martian mists or haze above the latter. We hope that these Japanese observations will encourage A.L.P.O. members having adequate optics to commence looking at Mars at least occasionally in the morning sky. The angular diameter will have increased to 5".5 by December 15, quite sufficient to justify making drawings with 8- to 12-inch telescopes of good quality.

Mr. Elmer J. Reese directs attention to drawings of Conon secured by Mr. Lyle T. Johnson and himself on May 16, 1951; these are reproduced as Figures 3 and 4 on pg. 1. The faint parallel horizontal lines on Mr. Johnson's drawing are, of course, not on the moon itself but on the sheet of paper used for making the drawing. The term colongitude might be defined again for new readers; it is the lunar eastern longitude of the sunrise terminator measured at the equator all the way around up to 360°. The colongitude is approximately a measure of phase, being near 0° at first quarter, near 90° at full moon, near 180° at last quarter, and near 270° at new moon. It is an exact measure of the solar illumination of a lunar object except for the rather small changes in the sun's selenographic latitude. The colongitude is given at 0^h, U.T., for each day in the year on pp. 430-437 of the 1951 American Ephemeris and Nautical Almanac. It can be found for any time other than 0^h by using the rate of increase in colongitude of 0°.51 per hour.

Readers will quickly note both resemblances and differences between the drawings by Johnson and by Reese, many of the differences being due to different styles of drawing. In discussion some of the features we shall employ Reese's nomenclature, which may be found on Figures 5 and 6 on pg. 1 of our August, 1951,

issue. The dark band shown in the southeast part of the floor by Johnson is probably A, while the one shown by Reese is probably Z; and Resse shows Streak S, which Johnson omits. Perhaps the most puzzling difference, however, is that Reese shows Fault B all along the foot of the northwest inner wall of Conon as a continuous very dark streak, while Johnson does not draw the northeast part of B at all. Johnson's aspect is confirmed by a drawing by E. E. Hare with a 12-inch reflector on December 30, 1949, at colongitude 30°7; Reese's is confirmed by a drawing by S. Ebisawa with a 13-inch reflector on August 23, 1950, at colongitude 34°6 (Figure 6 on pg. 1 of February, 1951, issue), a drawing by D. O'Toole with a 6-inch reflector on March 29, 1950, at 35°3, a drawing by T. Saheki with an 8-inch reflector on April 17, 1951, at 39°7, and a drawing by W. H. Haas with a 6-inch reflector on June 25, 1950, at 30°1. It is very likely that Mr. Hare had the clearest view of the observers mentioned.

Examples continue to appear of surprising differences in the relative conspicuousness of dark streaks in Conon in different lunations. On October 31, 1950, at colongitude 152°9 Reese found Streak S very dark and conspicuous; but on September 21, 1951, at 155°2 it was invisible in better seeing than on the former date. Cleft V was extremely dark and prominent to Hare on December 30, 1949, at 30°7 but was invisible to both Reese and Johnson very near this lighting on May 16, 1951. Bearing on this general subject Reese remarks: "I am beginning to suspect that certain vagaries of seeing may be partially responsible for some of the observed changes in delicate lunar detail - especially the relative conspicuousness of delicate lines extending in different position angles. This could affect photographs as well as visual observations." If Mr. Reese's further studies should confirm his suspicions, the matter would be of the greatest importance to all those interested in apparent lunar changes.

Figures 5, 6, and 7 on pg. 1 should be especially of interest to A.L.P.O. members who now possess only small telescopes. Mr. Allen made the drawing of Erathosthenes in good seeing (seven on a scale of zero to ten, with ten best) and the other two drawings in almost perfect seeing (nine on the same scale). The sky was clear for all three views. These drawings are, in the editor's opinion, creditable examples of what a small telescope can do under favorable conditions. If a small telescope cannot rival a large telescope when other conditions are similar, the possibility of useful observations does nevertheless exist for careful and preservering amateurs equipped with small telescopes of good optical quality.

Figure 5 shows the dark areas that develop on the floor of the crater Eratosthenes under high solar lighting. Near full moon, in fact, it is difficult to trace the rim of Eratosthenes because of the many dark areas then present on the floor and walls. In the lunar afternoon the dark areas fade out. W. H. Pickering made an intensive study of these Eratosthenes dark areas and reported his results in six papers in Popular Astronomy from 1919 to 1924.

Mr. Allen's drawing of Aristarchus (Figure 6 on pg. 1) may be profitably compared to ones by E. J. Reese with a 6-inch reflector at colongitude 60°2 (Figure 4 on pg. 1 of March, 1951, issue) and by E. E. Hare with a 12-inch reflector at 61°4 (Figure 4 on pg. 1 of August, 1951, issue). The three drawings illustrate well how resolving power increases as aperture increases from 3.5 inches to 12 inches. Allen found the northern of the two dark bands on the east inner wall to terminate at the transverse dark cleft or ravine, and this aspect is shown by Reese and Hare in a number of drawings from 1946 to 1950. Indeed, Reese clearly drew this band to terminate at the cleft as long ago as April 10,

1941, at colongitude 69°4, an aspect confirmed fully independently by C. M. Cyrus two days later at 95°6. However, Haas repeatedly drew the dark band to extend to the rim of Aristarchus in 1936; and it is so represented on a map of Aristarchus that R. Barker, the B.A.A. lunar observer, communicated to the editor in 1941. Does the aspect change? Careful and regular observing of this dark band from sunrise on Aristarchus to full moon might lead to interesting and valuable results. In his recent view Mr. Allen further noted that the southern of the two dark bands on the east inner wall was extremely dark from the cleft to the east rim of Aristarchus, much darker than below the cleft (see Figure 6 on pg. 1). This aspect does not appear to have been recorded previously in our A.L.P.O. studies of Aristarchus, even upon rather good drawings made with instruments larger than Mr. Allen's very near the solar lighting at which he observed.

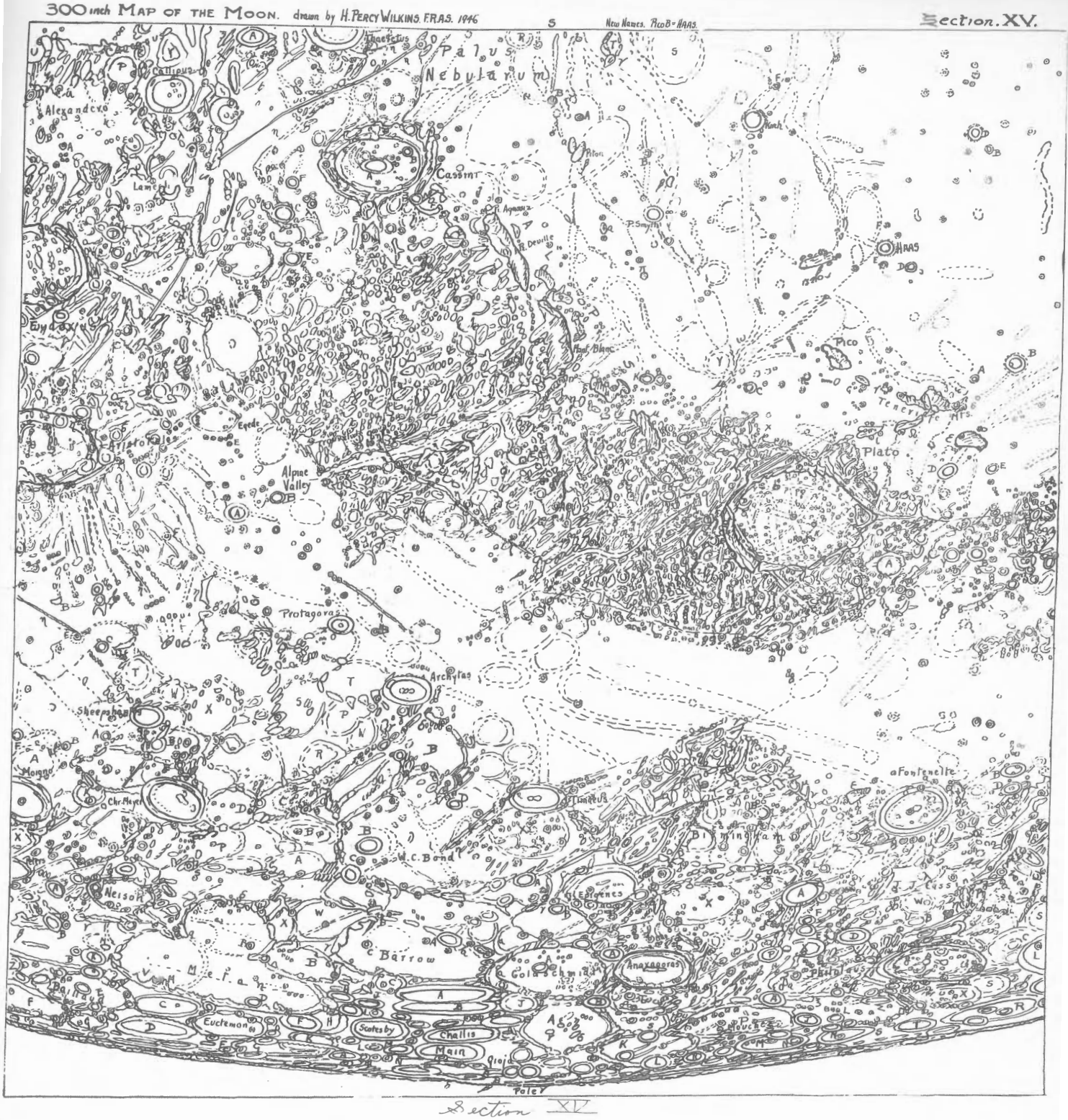
The intensity-numbers on Figure 7, the drawing of Plato, are on the Standard Lunar Scale of zero (shadows) to ten (most brilliant marks). Under high lighting there is a wealth of spots, streaks, and shadings on the floor of Plato; but there is so little contrast in tone that detail is difficult, especially with a small telescope. Allen found the floor appreciably darker near its center than near the walls. Occasionally the near-central spot (a craterlet) looked tiny and brilliant, presumably when the seeing was momentarily perfect.

Mr. D. L. Bellot of Long Beach, California, has communicated an observation of a lunar "flash" observed by his former neighbor, Mrs. James Finn, in his 8-inch reflector at 115X with fair seeing and somewhat poor transparency. The observation was made at $3^h\ 24^m$, U.T., on September 11, 1951. On a sketch Mr. Bellot locates the object in the Sinus Aestuum about two diameters of Eratosthenes west-southwest of that crater. The flash lasted for about two seconds and was two to three times as bright as the surrounding area. It is not stated whether or not the flash was stationary on the lunar surface. Have we here a lunar meteor? A flash of meteoritic impact? We have, alas, no confirmatory observation; and it is all too possible that no one else was watching this portion of the moon at the moment in question. Mrs. Finn evidently saw the "flash" very plainly.

Mr. A. W. Mount, 4326 Birchman St., Fort Worth 7, Texas in a letter dated September 29 reports a curious experience and offers what may be an important work of caution to observers of possible lunar meteors, as follows: "Several months ago I was in the process of making an eyepiece adapter with illuminated cross-hairs and had an interesting, and perhaps significant experience. I was holding the adapter in my hand (not in the telescope) and was observing the cross-hairs with a one-inch eyepiece. The battery was connected, and the cross-hairs were nicely illuminated. My arrangement gives 'bright wires' rather than a bright field. It was night, and the field was perfectly black. Suddenly a meteor-like tiny point of light appeared and made a short flight across a small portion of the field of view. The effect was startling. Had I been at the telescope, I would have surely recorded it as a telescopic meteor; and had I been observing the moon, I am sure that it would have appeared to be a lunar meteor. Actually, it was, of course, a microscopic dust particle that crossed the focal plane of the eyepice at a slight angle.

"It seems reasonable to suppose that the moon would illuminate such a particle in an eyepiece adapter not arranged for illuminated cross-hairs. The entire apparition would occur in that portion of the dust particle's flight in or quite near the focal plane. Their microscopic size would make them respond to even the slightest air movement; hence, their directions of flight would be quite unpredictable and perhaps not well related to the pull of gravity.

We invite readers to comment on Mr. Mount's letter. His remarks on possible false lunar meteors and Mrs. Finn's unconfirmed flash stress a need which we have stressed before: planned simultaneous searches for possible lunar meteoric phenomena are badly needed for further progress in this field.



SECTION XV

OF

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