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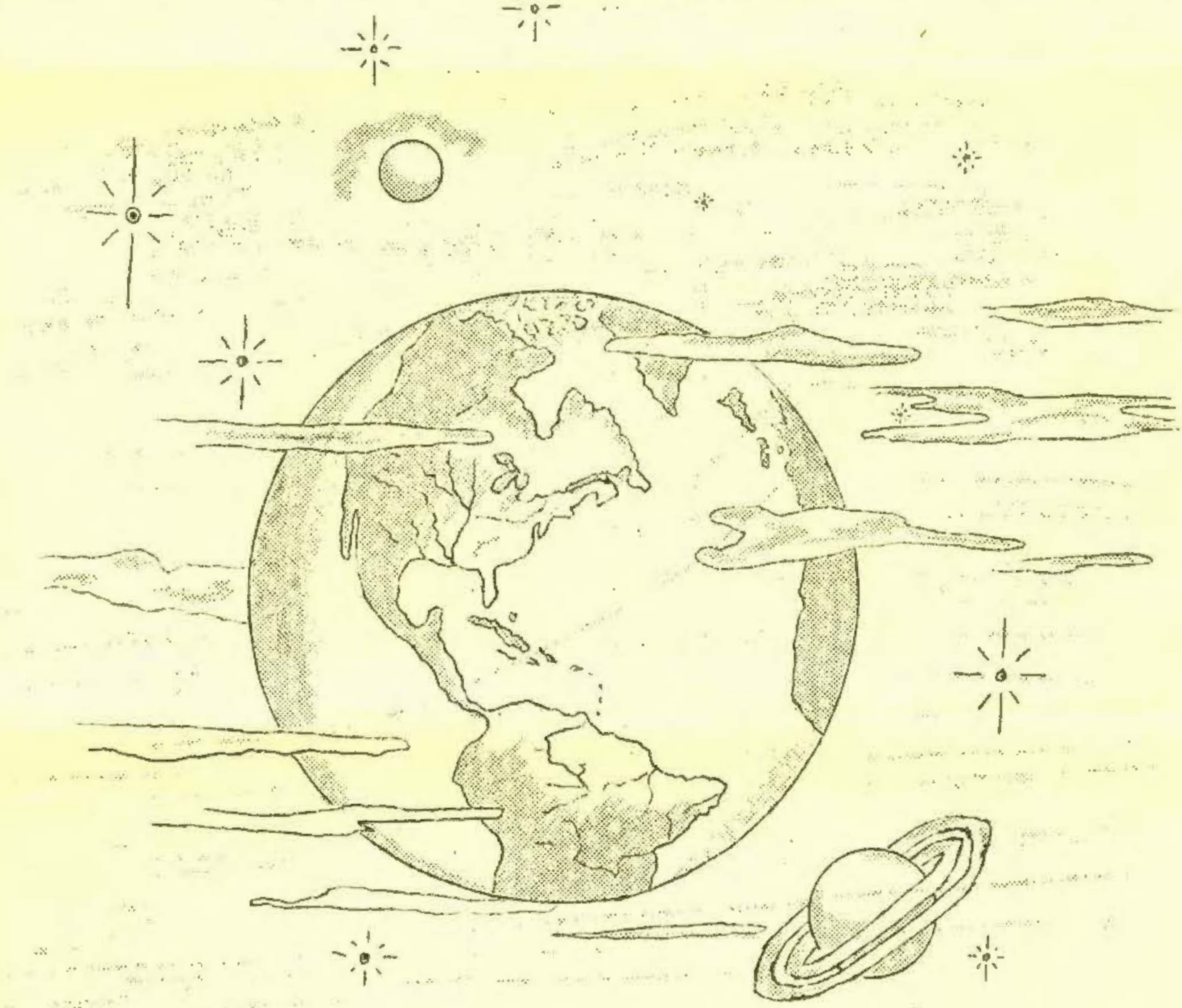

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THE LUNAR ECLIPSE OF APRIL 13, 1949

by Walter H. Haas

GENERAL

The purpose of this article is to report and interpret observations I have received of the total lunar eclipse on April 13, 1949. All dates and times are by Universal Time. Weather-conditions were rather unfavorable in the United States, and apparently also in some other countries where our Association has members; therefore, a fair number of would-be observers, including some of much ability and experience, were idle because of clouds, heavy haze, or fog. Times were as follows:

Moon enters penumbra	$1^h\ 32^m$
Moon enters umbra	$2^h\ 28^m$
Totality begins	$3^h\ 28^m$
Middle of eclipse	$4^h\ 11^m$
Totality ends	$4^h\ 54^m$
Moon leaves umbra	$5^h\ 54^m$
Moon leaves penumbra	$6^h\ 50^m$

BRIGHTNESS AND COLOR OF ECLIPSED MOON

There have been press reports, perhaps limited to the New York City area, of a "black eclipse", the first since 1844, in which the moon became completely invisible for a while. This state of affairs is completely contradicted by our observers, a number of whom express much surprise at the reports just mentioned. P. F. Froeschner at St. Louis, Missouri, was, in fact, surprised by how <u>bright</u> the eclipsed moon was. H. M. Johnson at Chicago, Illinois, observing with the naked eye from $3^h\ 47^m$ to $4^h\ 4^m$, found: "Characterizing that portion of the moon which is darkest as that lying nearest the 'core' of the umbra, I should call this a 'dark' eclipse, though by no means difficult to observe" M. Rosenkotter at Pierce, Nebraska, says that this eclipse, which he observed with the unaided eye, was the darkest one he had ever seen but that the moon was "far from being invisible.". That the moon did stay visible to the eye (and thus by inference in the telescope too) is confirmed by D.P. Barcroft at Madera, California, by C.P. Richards (observing) at Yakima, Washington, by a number of observers at or near Montreal, Quebec, Canada, and by D. W. Rosebrugh at Waterbury, Connecticut. A. Oshinsky observed on Long Island, New York, and was "astonished" by the darkness of the eclipse. However, his views were hampered by clouds; and Mr. Rosebrugh stresses that the moon never disappeared at Waterbury, even through "fairly dense haze". W. H. Haas in Albuquerque, New Mexico, with very clear skies paid little attention to the brightness of the eclipsed moon because of preoccupation with searches for possible lunar meteors; his <u>casual impression</u>

was that the moon in eclipse looked about the same as on July 16, 1935, August 26, 1942, and February 20, 1943. At Chicago, Illinois, and with a clear sky, C. B. Stephenson and H. M. Johnson, each employing a 3.5-inch telescope, found that each of them noted a star of magnitude 9.2 near the moon during totality but failed to see a star of magnitude 9.6 (Yale Catalogue magnitudes). Since a 3.5-inch telescope will go below 9.6 on a really dark sky, we appear to have further evidence that this eclipse was only moderately dark. (The Montreal group found stars in Virgo as faint as magnitude 5.5 to be visible to the eye during totality.)

A very well-planned program of observations of colors on the eclipsed moon was carried out by the Montreal observers. They supplied forms, with circles for sketches of the moon, to their observers. Some observers elsewhere made references to colors. Observations with the eye, with binoculars or opera glasses, and with telescopes up to 6 inches in aperture indicate the following picture of colors on the eclipsed moon: Those portions most deeply immersed in the umbra looked gray, probably because too poorly illuminated to show their real color. Those parts less deeply immersed showed a color in which red predominated, as was to be expected; they were variously described as "coppery reddish", "dirty or murky brown", "coppery", "rust red", and "brick color". Still nearer the outer edge of the umbra, the moon was brighter and more nearly gray, though probably showing some red or yellow. Finally, a greenish or bluish band bordering the edge of the umbral shadow was noticed by Barcroft near $4^h\ 43^m$, by Tisdale near $3^h\ 25^m$, and by some of the Montreal observers near either the beginning or the end of totality. Tisdale, who employed a 5-inch reflector with 45X in North Little Rock, Arkansas, found this band diffuse and 5 or 6 minutes of arc wide. He suggests that it may be a contrast-effect. At any rate, this greenish band is a common feature at lunar eclipses, and it is evident that the moon is here illuminated by solar rays which have passed through relatively little of the earth's atmosphere, which transmits chiefly the longer wave-lengths.

VISIBILITY OF PENUMBRAL SHADOW

Dr. Alexander Pogo in articles in Popular Astronomy has urged the careful determination of the limit of visibility of the penumbra. A. W. Mount at Fort Worth, Texas, could see nothing of the penumbra at $1^h\ 40^m$ and only suspected it at $1^h\ 48^m$, the sky being clear. Moreover, W. L. Orr with a 6-inch reflector at 65X at Montreal could find no penumbra-caused dimming at $1^h\ 44^m$. By $1^h\ 57^m$ a darkening of the limb of the moon was distinct to Mount, being easily seen with the eye through a medium neutral filter. At $2^h\ 8^m$ A. Hestin, Acy-en-Multien (Oise), France, using a 12-inch reflector at 100X, described the penumbral eclipse as "not very sensitive". At $2^h\ 15^m$ Mount noted: "Mare Humorum has become conspicuously dark to the unaided eye". He considered the darkening of the east quarter of the lunar disc now obvious to an informed observer. The Montreal observers noticed no penumbral shadow until $2^h 15^m$ (recorded then by R. Pringle both with eye and 1.5-inch refractor at 6X), probably both because they were hampered by clouds before totality and because they were less concerned with this investigation than Mr. Mount was.

TIMES OF CONTACTS

These were observed at Montreal by P.S. Scott with a 6-inch refractor at 45X and by C.M. Good with a 4-inch refractor at 75X. First contact was lost because of temporary clouds over the moon. Other results follow:

	Scott	Good	Ephemeris Value
Second Contact	$3^h\ 27^m.96$	$3^h\ 27^m.95$	$3^h\ 28^m.0$
Third Contact	$4^h\ 54^m.15$	$4^h\ 53^m.82$	$4^h\ 53^m.8$
Fourth Contact	$5^h\ 54^m.14$	$5^h\ 54^m.00$	$5^h\ 54^m.1$

IMMERSION - AND EMERSION - TIMES OF CRATERS

A number of observers timed when certain craters being watched for possible physical changes as a result of the shadow's passage were immersed in the umbral shadow and when they emerged from it. Such timings were made by F. De Kinder with a 4-inch refractor at 140X, D. Garneau with a 12-inch reflector at 80X, W. H. Haas with a 6-inch reflector at 188X, R. Missert with a 6-inch reflector at 50X, A. W. Mount with an 8-inch reflector, the Messieurs Roques with a 4-inch refractor at 106X, D. W. Rosebrugh with a 6-inch refractor at 74X, and C. B. Stephenson with a 3.5-inch refractor at 80X.

These times were obtained:

Riccioli Immersion.	Haas $2^h\ 31^m$. Stephenson $2^h\ 31^m$. Average $2^h\ 31^m$.
Riccioli Emersion.	Haas $4^h\ 57^m$. Stephenson $4^h\ 57^m$. Average $4^h\ 57^m$.
Grimaldi Immersion.	Stephenson $2^h\ 31^m$.
Grimaldi Emersion.	Haas $4^h\ 59^m$. Stephenson $4^h\ 58^m$. Average $4^h\ 58^m$.
Alphonsus Immersion.	Missert $2^h\ 53^m$.
Eratosthenes Immersion.	Garneau $2^h\ 56^m\ 9^s$. Haas $2^h\ 54^m$. Missert $2^h\ 55^m$. Average $2^h\ 55^m$.
Eratosthenes Emersion.	Garneau $5^h\ 16^m\ 41^s$. Haas $5^h\ 18^m$. Average $5^h\ 17^m$.
Plato Immersion.	De Kinder $3^h\ 9^m\ 34^s$. Missert $3^h\ 10^m$. Mount $3^h\ 9^m$. Roques $3^h\ 10^m$. Rosebrugh $3^h\ 7^m.8$. Stephenson $3^h\ 7^m$. Average $3^h\ 9^m$.
Plato Emersion.	Haas $5^h\ 14^m$ (?). Missert $5^h\ 15^m$ (late). Mount $5^h\ 12^m$. Stephenson $5^h\ 12^m$. Average of Two $5^h\ 12^m$.
Linné Immersion.	Garneau $3^h\ 8^m\ 39^s$. Haas $3^h\ 9^m$. Missert $3^h 8^m$. Stephenson $3^h\ 9^m$. Average $3^h\ 9^m$.
Linné Emersion.	Haas $5^h 28^m$. Stephenson $5^h 24^m$. Average $5^h 26^m$.
Atlas Immersion.	Garneau $3^h\ 23^m\ 29^s$. Haas $3^h\ 21^m$. Missert $3^h\ 22^m$. Roques $3^h\ 23^m$. Rosebrugh $3^h\ 25^m$ (?) Average of Four $3^h\ 22^m$.
Atlas Emersion.	Haas $5^h\ 33^m$.

It will be noticed that the observers usually agreed within a minute or two, which may indicate the degree of accuracy of observations of this kind. The worst discrepancy, between Stephenson and Haas on the Linné emersion, is four minutes. However, it appears vain to try to record such times to the second, the more so since the umbra may be several minutes in crossing a large crater like Plato or Atlas.

It is possible to compare some of these observed times with computational predicted values. E. J. Reese worked out a few such predictions with a method developed by H. M. Johnson in 1942. Moreover, predicted times for some of our objects occur in a long list published by W. Malsch on pg. 92 of <u>Sternenwelt</u> for April, 1949.

Event	Observed Time	Reese Prediction	Malsch Prediction
Riccioli Immersion	$2^h\ 31^m$	$2^h\ 30^m.5$	$2^h\ 31^m.0$
Riccioli Emersion	$4^h\ 57^m$	$4^h\ 56^m.7$	$4^h\ 56^m.5$
Grimaldi Immersion	$2^h\ 31^m$		$2^h\ 31^m.6$
Grimaldi Emersion	$4^h\ 58^m$		$4^h\ 57^m.9$
Eratosthenes Immersion	$2^h\ 55^m$	$2^h\ 55^m.1$	
Eratosthenes Emersion	$5^h\ 17^m$	$5^h\ 16^m.5$	
Plato Immersion	$3^h\ 9^m$		$3^h\ 8.0^m$
Plato Emersion	$5^h\ 12^m$		$5^h\ 11.0^m$
Atlas Immersion	$3^h\ 22^m$	$3^h\ 22.1^m$	
Atlas Emersion	$5^h\ 33^m$	$5^h\ 30.4^m$	

SEARCHES FOR POSSIBLE LUNAR METEORS

One of our chief observational programs was the attentive examination of the eclipsed moon for either lunar meteors (ones luminous in a lunar atmosphere) or lunar meteoritic impact-flares. In the table which follows the third column gives the interval within which the observer was watching for these objects. Some of them write of watching less closely at other times as well. The fourth column gives the total number of minutes spent in the searches. Some apparent inconsistencies between the third and fourth columns are due to the recorded failure of some observers to maintain a continuous watch for one reason or another. The fifth column lists the stellar magnitude of the faintest meteor or flare that might have been seen against the eclipsed moon. This limit of visibility is hard to determine and is for some observers merely my estimate, though a few others gave a value based upon the visibility of stars of known brightness near the moon. The sixth column gives the area in square miles of the lunar region watched; this area was 7,000,000 for those who surveyed the entire moon.

Observer(s)	Telescope	Interval(s)	No. Minutes	Limiting Magnitude	Area
E. E. Bridgen and D. E. Douglas	12" refl.	3^h35^m-4^h53^m	75	12	7,000,000
P. F. Froeschner	10" refl.	3^h28^m-4^h54^m	80	9	3,500,000
W. H. Haas	6" refl.	3^h30^m-4^h55^m	73	11	7,000,000
Mrs. F. Hall and H. Newman	5" refl.	3^h30^m-4^h54^m	83	10	7,000,000
H. M. Johnson and F. R. Vaughn	3.5" refl.	2^h56^m-4^h42^m	91	8.5	7,000,000
E. Kish	2" refr.	3^h28^m-3^h33^m 3^h35^m-3^h45^m	15	7	7,000,000
W. E. Leeson	3" refr.	"at intervals"	?	9	7,000,000
A. R. MacLennan	3" refr.	3^h28^m-4^h0^m	32	9	7,000,000
R. Missert	6" refl.	3^h36^m-4^h2^m 4^h10^m-4^h20^m	31	9	7,000,000
A. W. Mount	8" refl.	3^h34^m-3^h42^m 3^h48^m-3^h54^m 4^h1^m -4^h 8^m	21	11	7,000,000
R. Nigro, E. Mayer and D. Morris	6" refl.	3^h34^m-4^h 6^m	31	9	7,000,000
W. L. Orr	6" refl.	4^h 8^m-4^h26^m	18	11	7,000,000
D. W. Rosebrugh	6" refr.	3^h50^m-4^h1^m	11	11.4	7,000,000
C. B. Stephenson	3.5" refr.	3^h40^m-3^h59^m 4^h 3^m-4^h26^m	19 23	8.5 8.5	6,500,000 7,000,000
J. W. Tisdale	5" refl.	3^h50^m-4^h31^m	41	11	7,000,000

The results of the searches were negative with these exceptions only:

1. Using a 6-inch reflector at 47X in fair seeing and good transparency, W. H. Haas observed a moving bright speck at $4^h28^m.0$. "The speck appeared in the southwest part of Mare Imbrium and perhaps between Archimedes and Timocharis. The length of its path was about 4 times the major axis of the Plato ellipse, and the speck moved toward lunar west. The path may have been curved (not a great circle).

No trail remained visible after the speck had passed. The speck's angular diameter was inappreciable. The stellar magnitude averaged 11 but was variable. The duration was 2.5 seconds. The color was perhaps yellow but was hard to judge because of faintness". The object thus resembled about 20 moving lunar specks seen outside of eclipses by various members of the A.L.P.O in the years 1941-9. The observer felt confident of the reality of his observation.

2. Speaking of searches for lunar meteors during the eclipse by observers in the Buffalo, New York, area, R. Missert wrote in part as follows on April 25: "Clouds of a dense hazy nature interfered with observations sometime after the beginning of totality and did not cease hampering observations until well after the eclipse was over. No flashes were seen by Edward Kish, Gene Mayer, David Morris, or myself; but Richard Nigro did glimpse some sort of flash over the Apennines at [3^h 58^m]. However, he reports that the view was not sufficiently clear cut or noticeable enough to be sure of the nature of the object. I have mentioned it because it might possibly have coincided with a rather swift object [a moving speck] which I noticed from the corner of my eye near Copernicus and Eratosthenes at about this time. [Missert mentally noted the time to be about 3^h 59^m.] I didn't make a record of it at the time because my impression of the object seemed too fleeting. From talking with Dick [Nigro] I would tend to class this incident as a coincidence unless, of course, it may have been confirmed elsewhere. Without the coincidence in the times we both feel that we would not have recorded the object due to the large amount of uncertainty attached to it."

3. Another observer, who prefers to remain anonymous, suspected a moving bright speck at about 3^h57^m. Its position on the moon was such that identity with the Missert-Nigro object (supposing they saw the same object) is ruled out. This unnamed observer was very uncertain of the reality of his observation.

(To be continued)

OBSERVATIONS AND COMMENTS

Readers are reminded that dates and times are by Universal Time unless the reverse is explicitly stated.

During its favorable April-May, 1949, evening apparition Mercury was observed by T. R. Cave with a 6-inch reflector, T. Cragg with a 6-inch reflector, W. H. Haas with a 6-inch reflector, L. T. Johnson with a 10-inch reflector, H. Oberndorfer with a 4-inch reflector, G. D. Roth with a 4-inch reflector, C. B. Stephenson with a 6-inch refractor, and J. W. Tisdale with a 6-inch reflector. Haas observed the planet on 12 dates from April 25 to May 18. His drawings show the bright cusp-caps, the bordering dark cusp-bands, the bright limb-band (perhaps an optical effect), and a number of dark arc-shaped markings chiefly along the terminator. We shall use Antoniadi's map of Mercury for nomenclature; this map is reproduced on pg. 193 of F. L. Whipple's Earth, Moon, and Planets. Two dark marks frequently drawn by Haas near the center of the terminator appear to correspond to Antoniadi's Criophori. He similarly often drew Atlantis on the south half of the terminator and sometimes showed Aphrodites on the north half. Haas rather consistently found the north cusp-band broader than the south cusp-band. In fact, on April 25 the north cusp-band was the easiest dark mark on the planet. This band may have grown lighter later, for it was called "inconspicuous" on May 8 and 9. The north cusp-cap was distinctly brighter than the south cusp-cap on April 30 and May 1, but otherwise the south cap was usually the brighter when any difference could be seen between them. In particular, the south was the brighter on May 2; and Haas thinks that it was then brighter than on either May 1 or May 4. Apart from the exceptions just noted, the detail appeared to remain the same from date to date. In Germany Oberndorfer "clearly recorded Criophori" (still Antoniadi's nomenclature), and Roth probably saw Criophori-Aphrodites on May 8. Cragg in a poor view on May 6 drew a large dark mark in the north half of the disc and a brighter area in the south half. Cave on May 5 and 9 saw markings more definitely than he ever had before. These consisted of a fair-sized brighter area near the middle of the terminator, a dark streak roughly perpendicular to the terminator somewhat south of its middle (one of Haas' two marks?), a very large triangular southern shading (Atlantis?), and a rather notable north cusp-band on May 9, when the seeing was better than on May 5. On May 7 and 9 Johnson suspected a bright area just south of the "equator" (assuming the cusps to be at the geographic poles); this area may be the one seen by Cragg, and perhaps by Cave as well. Stephenson on May 25 suspected a couple dark areas but was scarcely sure of anything except that the north part of the thin crescent was dimmer than the south part.

We now list observations of the phase near dichotomy. The phase-angle i is the angle at Mercury between lines drawn to the sun and to the earth. Theoretically the planet is gibbous when i is less than 90° and crescentic when i exceeds 90°. Cave on May 5 and 9 drew bulges and hollows upon the terminator much like those often shown along the terminator of Venus. Haas noted that the dark cusp-bands can make the cusps falsely appear to project beyond adjacent parts of the terminator, a source of error probably augmented by irradiation.

Date	i	Observer	Phase
1949, May 4.1	82°	Haas	Terminator slightly convex
May 5.1	86°	Haas	Terminator least bit convex
May 5.1	86°	Cave	Terminator drawn convex
May 6.0	89°	Tisdale	South cusp perhaps slightly blunted
May 6.1	89°	Cragg	Phase gibbous
May 7.0	92°	Johnson	About half illuminated
May 7.1	93°	Tisdale	Terminator very definitely concave. South cusp perhaps less sharp than north.
May 8.1	96°	Haas	Terminator distinctly concave.
May 9.0	99°	Johnson	Slightly less than half illuminated.
May 9.1	99°	Cave	Terminator drawn concave.
May 9.1	99°	Haas	Terminator surely slightly concave.

The foregoing observations show the observed phase to be in good accord with what one might expect from the value of **i**, contrary to what has been found at some past apparitions of Mercury. It would appear desirable to repeat this study near future dichotomies of the planet.

Stephenson on May 25 made a rather unusual observation of Mercury between $1^h 30^m$ and $1^h 50^m$ with a 6-inch refractor. He had an impression with both 90X and 200X, though more readily with the lower power, that the unilluminated portion of the planet was barely visible as a dark area on the brighter sky. The impression of the visibility of this dark hemisphere was heightened by a feeling that the dark limb itself could be seen. The value of i at the time was 148° so that Mercury was closer to inferior conjunction than it is usually followed, and the planet's elongation from the sun was about 15°. Sunset occurred at Stephenson's station at $1^h 10^m$ so that he was watching Mercury by fairly bright twilight. The observation is reminiscent of the similar appearance sometimes imputed to the dark hemisphere of Venus near inferior conjunction; see, for example, The Strolling Astronomer, Vol. 2, No. 8, pg 4, 1948. Stephenson directs attention to an observation of Mercury on May 19, 1896, by Leo Brenner, who saw very clearly what Stephenson only suspected on May 25, 1949. Brenner observed Mercury between 10^h and 11^h, U.T., and on a forenoon sky. His report is in J.B.A.A. Vol. 6, pg 387. Probably using a 7-inch refractor, Brenner was astonished to see both spots on the disc and the dark side surrounded by an aureole. He says in part: "Fearing to be the victim of an optical illusion I tried various eyepieces (powers 146, 196, 242, 310, 410), changed the position of the planet in the field and shook the telescope, but both phenomena remained unchanged (respectively dancing with the illuminated disc in the same manner), so that there remained no doubt. Besides, after having made the drawing...I called Mrs. Manora, who believed for the first moment that it was Venus, as the appearance was so similar. She pronounced the dark side and the aureole to be very conspicuous objects, saying that she saw them at the first look, whilst she saw the spots on the illuminated disc later. The dark side was darker than the sky, just as I (with one single exception) have always found it in the case of Venus..."The italics are Brenner's own. Stephenson has computed the value of i to be 112° at the time of Brenner's observation. One can think of several possible explanations of this curious visibility of the dark hemisphere of Mercury (and Venus):

1. Illusion. Stephenson does not insist on the reality of his own impressions of May 25 but points out that Brenner appeared very confident. Also, on June 16, 1948, Stephenson, H. M. Johnson, and W. Lorenz all agreed that the dark hemisphere of Venus was visible and was darker than the daylight sky.

2. The silhouetting of the planet against an extensive outer solar corona or the Zodiacal Light, which would explain at once why the dark hemisphere would be darker than the sky-background. Probably this effect explains the common observation of the visibility of the outline of Mercury just off the disc of the sun at transits. Since Mercury was comparatively far from the sun's place in the sky on May 25, 1949, and on May 19, 1896, it would appear necessary to suppose the outer corona or the Zodiacal Light to have been abnormally bright on those dates. The aureole would now have to be supposed illusory.

3. The refraction, reflection, diffusion, etc. of sunlight in the atmosphere of the planet. This matter is not worthy of serious consideration for an aureole seen as close to dichotomy as Brenner's.

4. The occasional creation of an aurora in the planet's atmosphere by the arrival of particles emitted by the sun. Only a very rare atmosphere would here be needed. Since the planet is closer to the sun than the earth is, very extensive auroral activity might be more common. However, an aurora would tend to make the dark hemisphere brighter than the sky, whereas the observers have thought it darker, and would give rise to an aureole (Stephenson noticed none).

During the last two months we have received observations of Saturn from J. C. Bartlett (3.5-inch reflector), T. R. Cave (12-inch refractor, 8-inch reflector), T. Cragg (12-inch refractor, 6-inch reflector), W. H. Haas (6-inch reflector), E. E. Hare (7-inch reflector), M. B. B. Heath (10-inch reflector), L. T. Johnson (10-inch refractor, 10-inch reflector), R. Missert (6-inch reflector), and E. J. Reese (6-inch reflector). From late April to early June the four most conspicuous belts in order of decreasing ease of visibility were usually the doubled South Equatorial Belt, the broad and intense South Polar Band, the narrow North Temperate Belt, and the wide North North Temperate Belt. The S.P.B. sometimes looked like a shaded South Polar Region, which it probably really bounds; and similarly the N.N.T.B. simulated a North Polar Region. Johnson on May 6 thought the S.E.B. less conspicuous than last winter and on May 9 and 29 considered it "quite inconspicuous". The north component was probably darker than the south component. The N.T.B. was stronger in some longitudes than in others. Cragg continued frequently to see small white caps upon each Saturnian pole. Most of the observers recorded a faint Equatorial Band in the bright Equatorial Zone; but this Band was a difficult object, perhaps more difficult than in January-March, and was frequently quite invisible. Reese writes that the E.B. was very near the north edge of the S.E.B. on March 8, very slightly south of the middle of the E.Z. on March 14, 29, 30, and April 8, and near, or very slightly north of, the middle of this zone on April 21 and 26. He wonders whether others confirm this northward trend. It may be confirmatory that Cave drew the E.B. well to the north of the middle of the E.Z. on April 10 and 23 and May 4. On May 21 Haas placed this belt slightly south of the middle of the zone. Besides the five belts already mentioned, Cave, Cragg, and Hare have found at least two, and perhaps really four, faint belts in the space between the S.E.B. and the S.P.B. Hare in mid-April found some evidence that each of two of these South Temperate Zone belts was stronger in some longitudes than in others. In April and May Johnson and Missert made the ball more dusky south of the S.E.B. than north of the rings, but Bartlett had the opposite impression. Haas found the south hemisphere more dusky in April and no difference in May and early June, except for the N.Tr.Z. as noted below. Except for the shaded North Polar Region which is probably the N.N.T.B. of some observers, Bartlett was able to see no belts in the north hemisphere after March 22, his last known observation being on May 5. Cragg detected several narrow brighter zones on the ball, one in the South Temperate Zone, one near the edge of the shaded South Polar Region, and one near the edge of the shaded N.P.R., as well as a wide zone between the N.T.B. and the N.N.T.B. These zones were brighter in some longitudes than in others. Up to May 9 Haas found the North Tropical Zone, the space between the N.T.B. and the projected rings, the same tone as the ball just north of the N.T.B. From May 14 to May 21 the N.Tr.Z was slightly brighter than that part of the ball. On May 23, June 2, and June 8 the N.Tr.Z. looked notably bright to Haas and was about equal to the duller south part of the Equatorial Zone. It may be remembered that this N.Tr.Z was moderately brilliant for a time in the autumn of 1948.

Different observers agree that the Third Division near the inner edge of Ring B is the most conspicuous division after Cassini's and that Encke's in Ring A ranks third. On April 23 Cave and Cragg had a most excellent view of Saturn with the Griffith 12-inch refractor and were able to see all six divisions. Although Cragg was not quite certain of the Fourth Division in the outer part of Ring B, Cave says: "Every division which is known to our group was absolutely visible." Cragg adds the important fact that Mr. De Palma, President of the Los Angeles Astronomical Society, on that night "saw both the Fifth [between B and C] and Sixth Divisions <u>without</u> knowing where they were". With the 12-inch on April 9 Cragg estimated that the Sixth Division in Ring C lay 4/9 of the way from the outer edge of that ring to its inner edge and 2/10 of the way from the inner edge of Ring B to the ball. Missert has seen Ring C at the ansae several times and has estimated that it extends 0.45 to 0.5 of the way from the inner edge of Ring B to the globe. Cragg obtained 0.45 on April 9. On April 27 Reese in a letter expressed confidence that Ring B in the ansae was surely dimmer relative to the globe than in the middle of February. (He had found the rings to be growing dimmer since March 8.) Hare wrote on May 10 that he agreed with Reese that the ring-system, including Ring C, looked less luminous than at opposition last February. Haas also concurs and noted on May 9: "The rings are surely dimmer than in January and February." On May 9 Johnson suspected a narrow bright outer edge of Ring B beside Cassini's; Reese has reported such an outer annulus.

We proceed to estimates of the breadth of the Crape Band at the central meridian, the unit being the breadth of Cassini's at the ansae. Cragg obtained 1.1 as the average of 6 estimates from April 1 to April 23. Hare in April and May obtained 0.8 or 0.85 on several different dates. Missert estimated 0.5 on March 8, 0.7 on April 4, and 0.9 on April 12. Johnson found much more than 1.0 on May 6 and 1.5 on May 9. On May 6 and 29 he thought the Crape Band about equal in width to the projected Rings A and B, though at least on May 6 the difficulty of seeing the north edge of Ring A against a ball much the same brightness as itself made the observation rather difficult. Haas obtained 0.86 as the average of 9 estimates from April 29 to June 8. E. E. Hare has computed the theoretical width of the Crape Band at the C.M., the width of Cassini's at the ansae being the unit. He assumes this division to be 2400 miles wide, a value derived by him and Reese from comparisons of Cassini's to the known width of Ring A. Hare further supposes that the Band is the shadow of Rings C and B, not the projection of Ring C, (<u>The Strolling Astronomer</u>, Vol. 3, No. 1, pp. 5-6, and No. 5, pp. 10-11). His results are 0.68 on March 1, 0.84 on April 1, 0.93 on May 1, and 0.93 on June 1. These values are incompatible with some observations in recent months that the Crape Band was wider than Cassini's, including E. K. White's experiment with a micrometer-wire on April 12 (pg. 10 of May issue). Hare suggests that the observers have been deceived into thinking Cassini's too narrow with the rings as little opened as at present. Perhaps one cannot expect much accuracy since the two features being compared had widths of only 0".4 to 0".6 in March-June. M.B.B. Heath has made numerical estimates of the intensity of the Crape Band in 1948-9 on a scale of zero to ten, where ten denotes perfect blackness. His results may be summarized as follows: November-December 6.0 (4 estimates), January 4.3 (3 estimates), February 6.8 (5 estimates), March 7.8 (5 estimates), and May 9.0 (4 estimates). Mr. Heath thus confirms the striking darkness of the Crape Band last spring. The indicated increase in darkness from January to May in the editor's opinion is probably partly real and due to the fact that the shadow of Ring B composed an increasing portion of the Band from February 18 to mid-May and partly apparent only and due to the increase in the width of the Band with the southward motion of the south edge of the shadow of C from December to May.

In April and May Bartlett observed the S.P.R. to be gray or gray-green, the S.E.B. gray or brownish, a South Temperate Belt grayish, the E.Z. white, the South Temperate Zone white or dusky yellow, and the N.P.R bluish gray on April 28. Reese on April 21 and 26 made the N.P.R. gray and the S.T.Z. ochre. Haas in April and May found Rings A and B white or white tinged by blue or purple, the S.E.B. varying from red-brown to gray tinged by brown, the S.P.B. gray or brownish gray, the Crape Band dark red-brown, and the rest of the ball white or gray. Hare on April 14 was surprised to find the E.B. a clear yellow color, for it had been neutral gray in March. A colored drawing by him on that date shows the S.E.B. components and two South Temperate Belts red, the S.P.B., S.P.R., N.T.B., and N.P.R. gray, Rings A and B white, the E.Z. white, and other zones yellow. Subsequent to April 14 Hare usually found the E.B. "gray with a yellowish tinge suspected". Fine detail seen on the ball during April and May by some of the observers includes humps on the north edge of the S.E.B., oval bright areas in the E.Z., dark condensations in the north part of the S.E.B, humps on a South Temperate Belt, and humps on the north edge of the S.P.B. (noted by both Cragg and Bartlett). On pg. 3 of our June issue we mentioned the curious and presumably illusory white spot on the rings beside the shadow of the ball. Cave, Cragg, and Haas have recently observed this feature rather regularly. Cave has had the curious experience of finding it always much more prominent in good to fine seeing, and Haas has often seen it plainly in good seeing.

Drawings of the elevated lunar plain Wargentin have been received from Reese, Hare, and Cragg. Perhaps the clearest view was obtained by Reese at 4^h on February 12, 1949, when the eastern longitude of the sunrise terminator was $77^\circ.5$. One interesting aspect of his drawing at that time is a pair of parallel dark bands east of the low longitudinal ridge on the floor of Wargentin, which dark bands Hare saw on February 11. They suggest the similar-looking parallel dark bands on the inner walls of Aristarchus, but these features in Wargentin lie on a level crater-floor.

Cave observed the Linné white area on April 9 at 7^h 20^m with a 12-inch refractor at 550X. The eastern longitude of the sunrise terminator was $41^\circ.3$; the terminator was thus fully 53 degrees east of Linné. In spite of this rather high lighting Cave found "good indications of a tiny craterlet near the center" of the area, his drawing showing shadow in the west part of the craterlet. Hare observed this craterlet in May and June and sought to determine its size by comparing it to neighboring craterlets on Mare Serenitatis, the sizes of which were measured on a Lick Observatory photograph. Hare thus secured for the diameter in miles of the Linné craterlet 1.6 on May 5, 1.1 on May 6, 1.6 on May 7, and 1.1 on June 4. On May 8 and June 4 Hare found the shadow inside the Linné white area to lie west of its center, probably because lying in the west part of the craterlet. When the craterlet was just inside the terminator on June 3, its east wall was seen to be lower than its west wall. This Linné craterlet has now been seen by so many members of the A.L.P.O. that its existence cannot be doubted; however, more observations with <u>good</u> definition are desired in order to establish its dimensions and detailed appearance.

A few drawings of Plato have been received from Hare (7-inch reflector) and from Cave and Cragg (12-inch refractor). These observers have been able to detect shadows in as many as five of the small craterlets on the floor when Plato is two or three days from the sunrise terminator. As for the twin craterlets in the north central part of the floor (The Strolling Astronomer, Vol. 3, No. 1, pp. 3-5), Hare wrote on June 17 that he has recently determined the western one to be the larger on the inside and that near lunar noon each white spot is larger than the corresponding crater. Hare's first opinion accords with W. H. Pickering's 1892 micrometric measures under low lighting. Cragg, however, on April 9 thought the eastern craterlet of the pair very slightly the larger. Cave on that same date near $7^h\ 8^m$ was surprised to see "a vague elongated area of definite green tint" near the north rim of Plato. Fearing to be deceived by secondary spectrum, Cave moved the telescope slowly in both right ascension and declination; but the green remained visible. He observed again 22 and 1/2 hours later with his 8-inch reflector (thus near $5^h\ 38^m$ on April 10); but the color was gone, and he had never seen it again when he wrote on June 12.

MISCELLANEOUS

Erratum. Near the bottom of pg. 7 of our May issue the letter about the naming of Crater Porter was incorrectly attributed to Mr. Ingalls. It was, of course, written by Mr. H. P. Wilkins, Lunar Director of the British Astronomical Association.

For some time a number of members of our A.L.P.O. have urged that we organize ourselves into Observing Sections, each Section having a Recorder or Director, much as the B.A.A. is organized. It is hoped thus to secure the more rapid and effective analysis of observational data and the faster publication of papers on results obtained. The editor is glad to report that a start has been made in this direction and that we now have as Section Recorders:

1. Acting Venus Recorder - Thomas R. Cave, Jr., 265 Roswell Avenue, Long Beach 3, California.
2. Acting Jupiter Recorder - Elmer J. Reese, 241 South Mount Vernon Avenue, Uniontown, Pennsylvania.

In the future all observers of Venus are asked to submit their records (or copies thereof) to Mr. Cave, who will discuss their work both in The Strolling Astronomer and elsewhere; and similarly all observers of Jupiter are asked to send their records to Mr. Reese. It is planned to try to find additional Section Recorders for other phases of the Association's activities. The editor is very willing to see that observations sent to him reach the proper Section Recorders, but it will be more efficient for observers to communicate directly with the Recorders.

We regret very much that it has become necessary to increase the price of The Strolling Astronomer to three dollars a year. The periodical has long been published at some loss, and it is no longer possible to continue to publish at all at the present rates. The new price will go into effect on August 1, 1949. We shall accept renewals and new subscriptions at the lower rates before that date.