The ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS

The Strolling Astronomer

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In This Issue

THE STROLLING ASTRONOMER

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The Strolling Astronomer

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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.

ANNOUNCEMENTS

Errors in November 1953 Issue: Pg. 153, left column, line 34, read "1942", **not** "1952". Pg. 155, right column, line 36, read "no less than 56". On Pg. 161 one of the spots was omitted from the list. This spot was first seen on October 2, 1951 at longitude 116°.6—I on the N.E.B. s and was last seen on the very same date, having thus an apparent age of 0.5 days.

Concerning This Issue. The present issue of **The Strolling Astronomer** is a combination of the January and February, 1954 issues. It is hoped that this combination will help a little in getting our periodical back on schedule. It will be noted that this issue is as long as two ordinary issues, and it is benig counted as two issues on subscriptions. Subscriptions which were to expire in **either** January, 1954 **or** February, 1954 are considered to expire with **this** isuse. We shall be glad to hear from our readers how they like the combination and may occasionally publish other combined issues in the future if comment is favorable.

An Acknowledgment. We express our thanks to **The Saturday Evening Post** for their mention of the A.L.P.O. and **The Strolling Astronomer** in their issue of March 6, 1954. An article called "The Mysteries of the Night" by Mr. Jerome Ellison described amateur astronomical activity in a popular, reliable, and sometimes amusing fashion. We heartily welcome to membership those new subscribers who first learned of us as a result of the **Post** article. We also thank our Secretary, Mr. David P. Barcroft, for his invaluable help in processing the correspondence resulting from the article.

MORE ABOUT THE O'NEILL LUNAR NATURAL BRIDGE

On pp. 147-150 of the October 1953 **Strolling Astronomer** we reported the late John J. O'Neill's discovery of a curious natural bridge on the moon. The bridge lay at the east shore of the Mare Crisium and connected the Promontorium Lavinium (on the south) to the Promontorium Olivium (on the north). We thought it very curious that a feature seen plainly by Mr. O'Neill with only a 4-inch refractor should have remained unknown for so long, and we remarked on the contradictory nature of a few other observations of this area. Since our October 1953 issue went to press, a number of A.L.P.O. colleagues have submitted observations of the O'Neill Bridge—or perhaps we should say of the site of the bridge, for not all of them agree that it exists. The contributors and their telescopes are: D. P. Barcroft (10-inch refl.); Rex Bohannon (6-inch refr.); J. T. Carle (8-inch refl.); Lonzo Dove (4-inch refr.); R. Doucet (3-inch refr.); Lyle T. Johnson (photographs with a 10-inch refl.); Donald J. Mary and others (12.5-inch refl.); A. C. Montague (4-inch refl.), Patrick Moore (12.5-inch refl.) and H. P. Wilkins (15-inch refl.). Since Dr. Wilkins used the largest telescope and is also the most experienced of the observers, we shall first give his findings in some detail.

O'NEILL'S "BRIDGE" ON THE BORDER OF MARE CRISIUM

BY H. PERCY WILKINS

Since there appears to be some misconception regarding the "gigantic natural bridge with the amazing span of 12 miles from pediment to pediment" detected by the late John J. O'Neill on July 29, 1953, the following observations will, it is hoped, make the matter clear.

The observations, made on February 20-21, 1954, confirm previous ones to the effect that while there does appear to be an arch, bridge, or aperture in the mountain border of the Mare at this point, it does not possess a span of anything like 12 miles but, as I have maintained since I first saw this peculiar feature in August 1953, one of about two miles only. That is, the actual aperture, or "hole," is about two miles wide; and it is through this narrow gap that the sunlight streams.

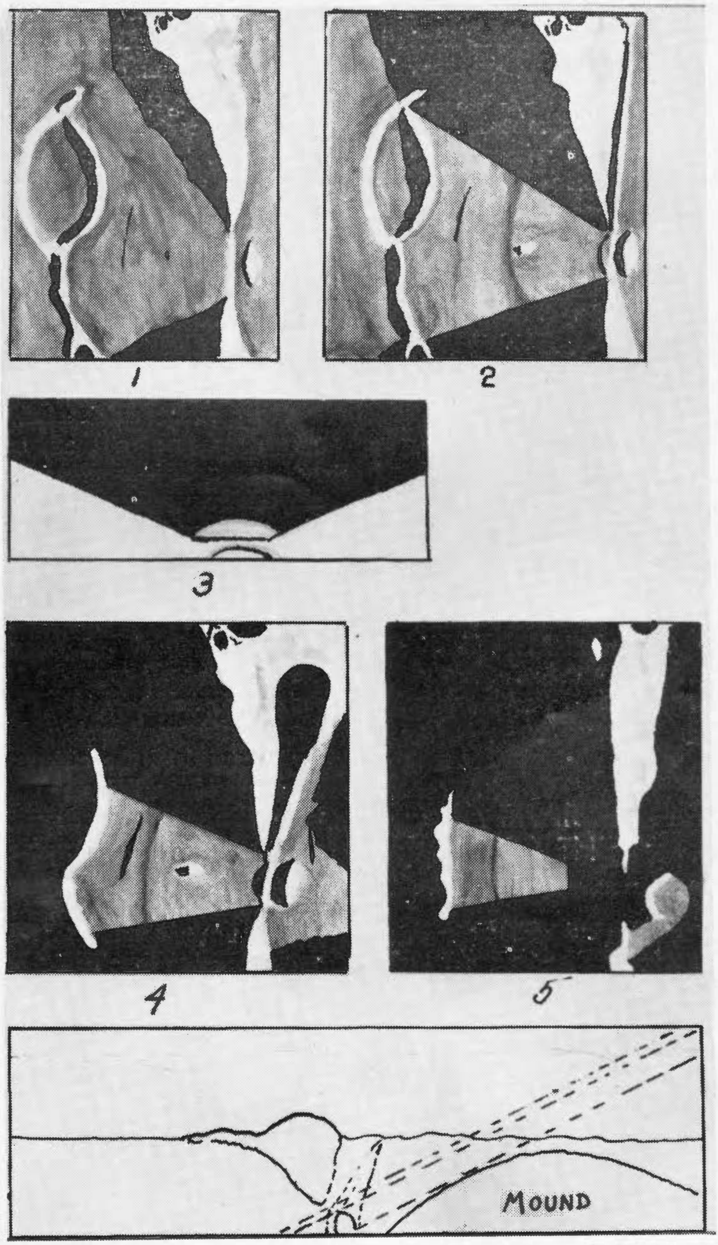
The drawings range in time from 23^h, U. T., on February 20 to 4^h, U. T. on February 21. They are reproduced on page 3. At an early stage of sunset the two promontories, Lavinium on the south and Olivium on the north, appear to be connected by a narrow bright line but, as the solar altitude declines, it is clearly seen that the ridge from Olivium passes a little to the east of Lavinium as shown by drawing 2 on page 3. At this stage a narrow, curved line of shadow may be seen west of the connection while, on the east is a mound with shadow on its western side. This narrow, curved line of shadow is that of the arch with a sunlit patch on both its east, where sunlight comes through the arch, and on its west. (Drawing 2). This mound is higher than the ridge, and its shadow soon falls upon the latter and even passes through the aperture with the result that all appearance of an arch is lost. This aspect is shown in Drawing 4. Drawing 3 indicates the appearance as seen from the surface of the Mare. It shows how rapidly the mountain border declines in altitude as the promontories are approached which explains the peculiar fan-shaped appearance of the shadows. Behind the aperture can be seen the higher mound. Finally the shadow of the mound covers the lower ridge, as shown in Drawing 5, and forms the eastern edge of the remaining sunlit strip of the Mare. From Drawing 6 on page 3, which does not pretend to be to scale, it is seen how the shadows observed are formed and how short a time is available for the arch appearance to be seen.

There does seem to be a natural arch here; but it is quite small, and the striking fan-shaped shadows have nothing to do with it. This will explain why some people have failed to find the feature; they have mistaken the striking shadows for the bridge and have overlooked the much more delicate but real feature.

* * * * * * *

We note that the colongitude of Dr. Wilkins' studies on February 20-21 was 124°.7 to 127°.2 and that the colongitude was 127°.2 when O'Neill discovered the bridge. For both Wilkins and O'Neill the libration in longitude, important for a formation near the west limb, was within a degree of its mean value.

On March 6, 1954 Dr. Wilkins wrote in part as follows: "It is also very queer that at sunrise a ray of sunlight, like a searchlight beam, can be seen coming, apparently, through a deep groove or ravine, with vertical sides and a flat floor, a little elevated above the ground on both sides. This ray seems to be a little to the north of the spot visible at sunrise but **there is no trace of this ravine at sunset.** Very odd indeed as are also the movements of the shadows within the old ring at sunrise. Even if we come to the conclusion that O'Neill was mistaken [in reporting an arch 12 miles long], we are still indebted to him for having brought this region to our notice; and I am definitely naming the region between Proms. Lavinium and Olivium 'O'Neill's Bridge.' It is also remarkable that, at a certain stage of sunset, Olivium is prolonged south by a narrow and very regular ridge which runs a little to the east of Lavinium but, shortly afterwards, it is seen to curve round to the east on the floor of the old ring. The existence of a wide ravine with vertical sides and a flat floor, proved by the shadows, is almost as surprising as a natural arch. That they should exist side by side is astonishing. Again sometimes we see the promontories as two craters, the larger to the north, while at other times there is no trace of them. The dusky bands which move along the fan-shaped sunlit area at sunset, and as it contracts, are also very queer. Their movement in 15 minutes is obvious, very different from the shadow of the low, curved ridge which lies a little west of the 'bridge'. The most careful observations are wanted, both at sunset and sunrise; and I am taking advantage of every favorable occasion and will send you more drawings."



Drawing of the O'Neill Bridge and vicinity by H. P. Wilkins. 15-inch reflector. Feb. 20, 1954 at 23^{h} U. T. to Feb. 21, 1954 at 4^{h} U. T. colongitude 124°.7 to 127°2.

Mr. Jackson T. Carle made careful observations of the O'Neill Bridge on January 21, January 22, and February 21, 1954 with his excellent 8-inch reflector. He feels still unable to come to a final conclusion about the topographical nature of the area. Figure 1 is one

Figure 1.—O'Neill's Bridge and Vicinity

J. T. Carle
8-inch refl. 320X
Jan. 22, 1954. 8^h 5^m, U. T.
Colongitude 124°.3

of Mr. Carle's drawings and shows well the ridge running south from Olivium to a little east of Lavinium. The solar lighting here is about an hour higher than on Dr. Wilkins' Drawing 1 on February 20 on page 3. Mr. Carle watched closely the large bright area in the shadow of this ridge; it changed shape between 7^h 15^m and 8^h 5^m, U. T., on January 22; and he **suspects** that it is sunlight streaming through an arch. The several tiny bright spots farther north in the shadow of the ridge are probably the tops of peaks along a ridge. Carle did not see Wilkins' mound just west of the lunar bridge. There is shown on Figure 1 a large "ruined ring," like Stadius not far from Copernicus, to the east of Olivium. On January 21 at colongitude 111°.7 Carle drew a black band just east of the ridge connecting (almost) the two capes. This black band then suggested a V-shaped natural trench or rift, but by January 22 the aspect had changed greatly. During their February 21 studies Carle and his co-workers concluded: "It also appeared evident that the floor of Mare Crisium to the west of the ridge was at a higher elevation and that it sloped down toward the opening between the two capes."

Mr. Patrick Moore, the Secretary of the B.A.A. Lunar Section, has observed this area several times. Writing on February 25, he did not feel satisfied that he had himself seen the bridge, perhaps only because his studies had been handicapped by poor seeing. Mr. Moore has seen several of the objects described above; and on February 21, 1954 at colongitude 125°.8 he drew a bright speck in the shadow of the ridge. Its position agrees well with that of the bright spot observed by Carle under slightly higher lighting on January 22 (Figure 1) and **suspected** by Carle of being sunlight passing through an arch. Moore's drawings do not appear to show Wilkins' mound just east of the unsupported arch in the long ridge from Olivium to near Lavinium.

The reports of other observers will perhaps chiefly result in a picture of remarkable confusion! D. P. Barcroft on January 22 saw the ridge well enough but, like Carle and Moore, feels unable to decide on the nature of the topography of what must be a singularly difficult region. In other words, he does not feel that he has seen anything which either definitely confirms or decisively contradicts the existence of a natural bridge.

A. C. Montague on February 19, 1954 at colongitude 103°.1 saw well the crater on each promontory, as mentioned in Dr. Wilkins' letter quoted above, and with the larger crater to the north; but the solar lighting was naturally too high for a critical study. Mr. Doucet is confident that he saw the bridge with his 3-inch refractor on February 21 near 127°.7. Rex Bohannon, however, on March 3 wrote as follows of his February 21 observations with a 6-inch refractor: "Under low power it looks like a bridge. Under high power it is merely an effect and is caused by a rising area coming up out of the blackness in line with the setting sun and a ridge of mountains. Shadows are so placed that they cause the appearance of sunlight coming through and underneath a so-called bridge." Mr. Mary at 127°.9 on February 21 saw no indication of a natural bridge. According to Wilkins' observations on the same date, it was by then covered by the shadow of the mound to its east. None of the observers mentioned in this paragraph saw this mound; perhaps it must be looked for rather closely. Mr. Lonzo Dove made drawings on February 19, March 7-8, March 8-9, and March 22, 1954. On February 19 he saw the black band between the capes observed by Carle on January 21 and then thought by him to be a V-shaped rift or natural trench. On March 8 near 32o° Mr. Dove noted: "A bright line extending from the S. Prom. ends with a shadowed crater pit. A parallel fine shadow hairline extends from the N. Prom. ending with faint dark bead, shadow in that crater pit. Two hours later a very fine dark line bordered the W. edge of the white line completely across the gap." The lines were in the same position as Dove saw them under opposite solar lighting on February 19.

Mr. L. S. Copeland of Santa Barbara, California on September 26, 1953 near colongitude 127° observed a "window in east wall of Crises," using a Cave 8-inch reflector. Available information is not sufficient to say whether he independently saw the natural arch, but he is very doubtful that he could have seen an arch only two or three miles long.

Lyle T. Johnson of La Plata, Maryland has not yet studied the O'Neill Bridge visually but has contributed photographs on November 5, 1952 at colongitude 123°.8 and on September 7, 1952 at 127°.4. These were taken with his 10-inch reflector at an equivalent focal ratio of 45 to 50, the one exposure for ¾ of a second and the other for 2 seconds. These photographs are of very good quality and show some of the features described above, including the ridge from Olivium to just east of Lavinium and the striking fan-shaped shadows of the two promontories. Mr. Johnson's photographs suggest that at just the right lighting he might have been able to record the natural arch and the mound to its east as described by Dr. Wilkins, though these objects would be easier to photograph with an aperture larger than 10 inches.

A. C. Montague has been interested in possible past records of the bridge. (However, if Dr. Wilkins' interpretation is correct, then the feature is difficult enough and visible at sunset briefly enough that its absence from old records means nothing.) Tracings sent by Mr. Montague from Krieger's **Mond Atlas** of 1912 show an object between P. Lavinium and P. Olivium, but its nature is uncertain. He has also sent us a sketch by Weinek in G. Riegler's **The Amateur Astronomer,** Dudd-Mead, 1910. This sketch shows a fine dark line joining the two promontories with the colongitude near 125° (Peirce and Picard very close to sunset terminator). In W. H. Pickering's Photographic Atlas of the Moon a similar appearance may be shown by Plate 3E at 122°. Mr. Barcroft writes that the low ridge from Olivium to slightly east of Lavinium can be found on many old drawings and photographs.

Obviously, this portion of the moon must be one of complex topography. Obviously also slight changes in lighting can create large changes in aspect under low lighting, and the varying libration in longitude must influence appearances so far west of the center of the moon. Our British friends Wilkins and Moore occasionally are able to study the moon with the Meudon 33-inch refractor and the Cambridge 25-inch refractor, and perhaps these giant telescopes will solve this lunar riddle. Meantime, we invite A.L.P.O. lunarians to see what they can of the O'Neill Bridge and to report their findings.

JUPITER IN 1953-54: INTERIM REPORT

BY ROBERT G. BROOKES

Observers

This Report is based on observations made through the period December 1, 1953 to March 1, 1954 by the following A.L.P.O. members:

Name	Telescope	Station
Leonard B. Abbey, Jr.	6-inch Refl.	Decatur, Georgia
R. M. Adams	3.3 and 4.3-inch Refrs. 10-inch Refl.	Neosho, Missouri
D. P. Avigliano	6 and 8-inch Refls.	Sierra Madre, California
Phillip W. Budine	3.5-inch Refl.	Walton, New York
Edwin J. Gilmore	6-inch Refl.	Allentown, Pennsylvania
Kazuyoshi Komoda	8-inch Refl.	Miyazaki City, Japan
Alan P. Lenham	3.0 and 3.3-inch Refrs. 6 and 9-inch Refls.	Swindon, England
A. C. Montague	4.3-inch Refl.	Oak Park, Illinois
Toshihiko Osawa	6-inch Refl.	Osaka, Japan
Owen C. Ranck	*4 and 10-inch Refrs.	Milton, Pennsylvania
Elmer J. Reese	6-inch Refl.	Uniontown, Pennsylvania
J. Russell Smith	8 and 16-inch Refls.	Eagle Pass, Texas
John E. Westfall	4-inch Refr.	Oakland, California

A Brief Description

Belts. The N.E.B. remains the most prominent belt. The intensity of the S.E.B. seems to be stabilized; it no longer appears to be fading as reported in the first Interim Report (**The Strolling Astronomer,** Volume 7, No. 12, 1953). The north edge of the S.E.B.$_N$ remains very dark with darker spots scattered along its length. In many instances these darker spots were connected by festoons to similar spots on the south edge of the N.E.B. The formation of an Equatorial Band seems to be more optical than real (see below: Observations and Comments).

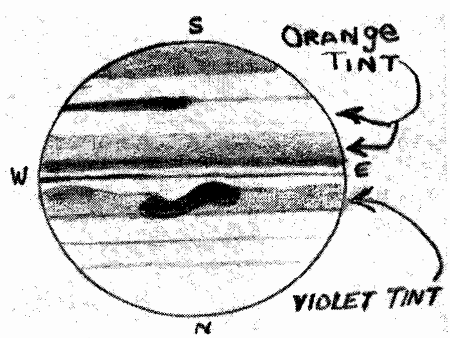


Figure 2. Jupiter
O. C. Ranck
4-inch refr. 180X
Jan. 17, 1954. 23^h 10^m, U. T.
C. M.$_1$ = 162°. C. M.$_2$ = 45°

* The 10-inch refracting telescope Mr. Ranck uses is the instrument at the Bucknell University Observatory.

Observers with telescopes of 6 inches aperture or less have recorded a fully developed E. B. in all longitudes on a number of occasions (Figure 2), but observers with telescopes of 8 inches and larger in aperture do not record a band. At times they record wisps in the location of the E. B. However, the usual E.Z. markings seen with the larger apertures are wisps and looping festoons (Figure 3).

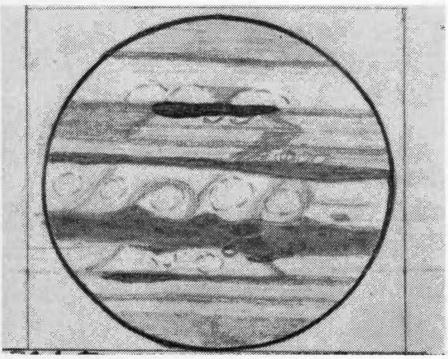


Figure 3. Jupiter
A. P. Lenham
9-inch refl. 265X
Jan. 30, 1954. 18^h 5^m, U. T.
C. $M._1 = 229°$. C. $M._2 = 14°$

The S.T.B. varies in its conspicuousness in different longitudes. It was most conspicuous between longitudes (II) 120° through 0° to 30°, approximately. Mr. Reese comments as follows about the S.T.B.: "It is especially dark near longitude (II) 0° where its blue-grey color contrasts beautifully to the rich orange hues in the S.E.B. The S.T.B. at times had an unusual appearance near the R.S.H. (Figure 4)."

The other belts seen and the order of their decreasing conspicuousness were the N. T. B., N. N. T. B., N. N. N. T. B., and S. S. T. B.

The two polar regions were varying shades of grey with the N.P.R. usually recorded as the darker.

Zones. The appearance of the zones

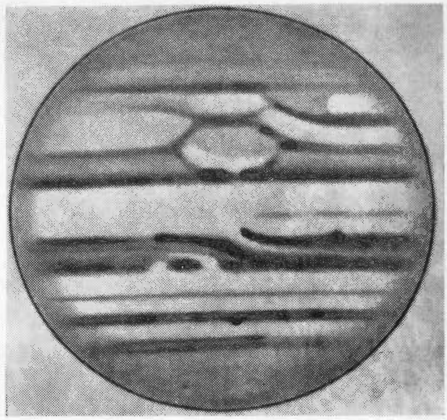


Figure 4. Jupiter
E. J. Reese
6-inch refl. 240X
Jan. 28, 1954. 23^h 41^m, U. T.
C. $M._1 = 118°$. C. $M._2 = 276°$

remains essentially the same as previously reported (**S.A.**, Volume 7, No. 12). The E.Z. is still the brightest, described at times as being very bright white. The N.T.r.Z. has been very bright and at times was reported to be as bright as the E.Z. However, it might be noted that when the N.Tr.Z. was recorded to be as bright as the E.Z., the E.Z. was not at its maximum brightness. The S.Tr. Z. has brightened somewhat. The S.Te. Z. is duller than the S.Tr.Z. The long-enduring bright sections in the S.Te.Z. are still being observed; one of these sections is visible on Figure 4 directly above the R.S.H., and another is visible near the following (or east) limb of the planet.

The Red Spot Hollow. The Hollow still exists in essentially the same form as previously reported. However, at times a darker shaded area is seen in its interior (Figure 4). Its center was located at longitude (II) 276° on January 28, 1954.

Observations and Comments

Mr. D. P. Avigliano has followed closely a rather unusual-appearing feature on the north edge of the N.E.B. It is shown

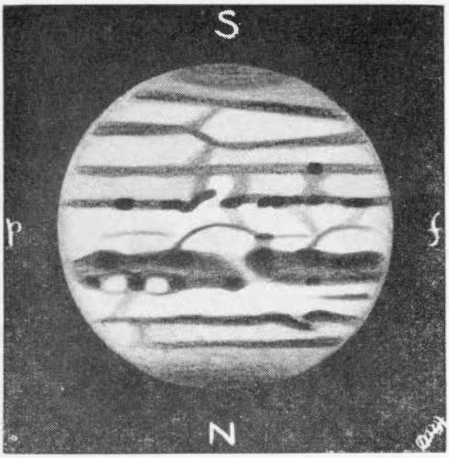


Figure 5. Jupiter

D. P. Avigliano
8-inch refl. 290X, 340X
Jan. 15, 1954. 4^h 50^m, U. T.
C. $M._1 = 256°$. C. $M._2 = 159°$

in Figure 5 west of the C.M. It was first recorded on a drawing made on December 10 at 7^h 10^m U. T., C. $M._2$ 149°. The first C. M. transit of the central dark spot was recorded on January 3 at 4^h 25^m U. T., its longitude (II) being 140°; since then 8 C. M. transits of the dark central spot have been recorded by Mr. Avigliano. Its longitude (II) on February 25 was 131°; thus its rotation period is shorter than the adopted rotation period for System II.

Mr. Avigliano's drawing of December 10, 1953 (Figure 5) also shows the E.Z. features as they most generally appear to observers using telescopes of apertures larger than 6 inches. Mr. Avigliano was asked to stop his 8-inch reflecting telescope down to see whether at smaller apertures the ordinary E.Z. detail would appear as a band; his results were negative. He comments as follows: "With apertures below 6 inches the detail in the E.Z., if prominent, could be detected but not delineated (with 1.5 inches to 4 inches almost nothing could be seen). With 6 inches the detail in the E.Z. could be detected but was usually somewhat undefined. The 8-inch [telescope] resolved the E.Z. pattern for me, the difference between 6 inches and 8 inches being very noticeable." He concludes: "It must be remembered that the above results pertain to my particular eye at this particular location (Sierra Madre, California). The ability of the observer to see in relation to the aperture used varies with the individual observer."

The probable explanation of the E.B. is that observers using the smaller apertures (8 inches and below) are connecting the ordinary E.Z. detail into a band. Mr. Avigliano's failure to see anything resembling an E.B. using the smaller apertures is probably explained by Mr. Walter Haas, who writes: "Perhaps it is psychologically difficult for those who have seen the correct aspect [of the E.Z.] in larger instruments to admit the **impression** of a band with stops on their telescopes."

Mr. Phillip W. Budine had an interesting view of the Giant Planet on February 20 at 2^h 45^m U. T., C. $M._1$ 102°, C. $M._2$ 92° (Figure 6). He described the N.E.B. as having a "wavelike appear-

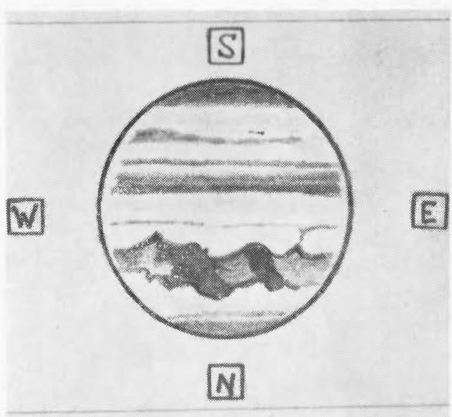


Figure 6. Jupiter

P. W. Budine
3.5-inch refl. 125X
Feb. 20, 1954. 2^h 45^m, U. T.
C. $M._1 = 102°$. C. $M._2 = 92°$

ance" and shifted farther to the north than he had ever before seen it. Another interesting feature of this drawing is the appearance of the E.B. Mr. Budine uses a 3.5-inch reflecting telescope (Skyscope).

Mr. Alan P. Lenham has noticed during some of his recent observations that the detail in the polar regions is more clearly defined on the part west of the C. M., regardless of longitude, than on the eastern side. He poses the question as to whether this aspect could be caused by atmospheric conditions of Jupiter, namely the formation of high thin veiling condensations on the dark and colder side of the planet and their dissipation as they are brought into the warmer lighted side of the planet. Or could it be due to ultraviolet action? Has any other observer noticed this phenomenon; and if so, does he have any ideas as to cause?

Observe the Transits of Satellite Shadows

Mr. F. M. Bateson, Director of the Jupiter and Variable Star Sections for the Royal New Zealand Astronomical Society, has brought forward a most interesting **speculation** as to the physical structure of Jupiter's atmosphere. Briefly, Mr. Bateson suspects that Jupiter's atmosphere is "composed of layers of varying density" and that the various layers usually merge into one another. However, he suggests that on certain occasions the layers are separated by boundaries of lesser density. This latter statement, he believes, is supported by observational evidence, such as the phenomena recorded when Jupiter occulted the star Sigma Arietis; i.e., the star alternatively was dimmer and then brighter as it was occulted. Mr. Bateson recorded nine distinct flashes as the star was disappearing behind Jupiter (**Journal of the British Astronomical Association,** Volume 63, No. 3, pp. 120-121). This dimming and brightening of Sigma Arietis as it was occulted was also recorded by other observers (**The Strolling Astronomer,** Volume 7, No. 1, pg. 2). Also, Mr. Bateson considers that the doubling of satellite shadows indicates that, at least on occasion, Jupiter's atmosphere is composed of layers separated by boundaries of lesser density. There are two views as to the cause of the doubling of satellite shadows (and as far as the Recorder knows, only two such observations have been recorded). Mr. Bateson observed the shadow of Satellite I double on December 10, 1951, $6^h\ 0^m$ to $6^h\ 40^m$ U. T. (**J.B.A.A.** Volume 62, pg. 283); and he believes that the double shadow occurred on Jupiter and that it can be explained by the above-mentioned causes. Mr. Bertrand M. Peek observed a doubling of the shadow of Satellite I on February 19, 1942 (**J.B.A.A.,** Vol. 63, pg. 120); but he regards the phenomenon as being caused by local conditions, i.e., atmospheric disturbances within the telescope tube.

Members of the A.L.P.O., and any other observers who may be interested, are urged to pay special attention to transits of satellite shadows in the future. Perhaps if enough observers watch for this phenomenon, it can be determined whether the doubling of satellite shadows actually occurs on Jupiter or is of a local nature.

A FILAR MICROMETER FOR THE AMATEUR

BY WALTER H. HAAS

The filar micrometer is an instrument for measuring with great precision the distance and angular separation between two selected celestial points at most a few minutes of arc apart. Thus it may serve to determine the angular diameter of a planet, the two points here being on opposite limbs, or the distance between the components of a double star, the two points now being the two stars. The micrometer is a small instrument and fits into the eyepiece holder of a visual telescope. In its most common form it consists of one fixed wire and, parallel to it, one movable wire, the "wires" often being very fine spider webs. The movable wire is moved by turning a fine-threaded screw, which allows considerable precision and which is spring-loaded to eliminate backlash. The position of the movable wire is read on a graduated head; i.e., the fraction of a turn is read from this head (often estimated to the one-thousandth of a turn), and the whole number of turns is easily kept track of when necessary. The entire micrometer box containing the wires can be rotated, and the angular direction or position-angle is read on a scale graduated in degrees.

In using the instrument the observer first focuses the micrometer eyepiece, which must be a positive eyepiece, upon the wires and then focuses the telescope itself in the usual manner. On a night sky the wires are faintly illuminated by a small lamp in the micrometer head in order that they can be seen. Of course, no such illumination is necessary in daylight or twilight observations or in measures of lunar features. If directions are being determined, it is necessary to find the angular scale reading for some known direction. An easy solution is to stop the driving mechanism of the telescope for a few minutes and rotate the box until some star is moving along a wire in its diurnal drift. All other directions can then be referred to this known one, which can be re-established at the close of the night's work. In measuring distances the wires must be at right angles to the line being measured since their direction of motion is at right angles to their direction. In most measures of distances the value of the **micrometer constant** must be known, i. e., the number of seconds of arc corresponding to one turn of the screw. This constant may be established by a very long series of measures of some accurately known distance, the diameter of a planet or the separation of a double star. The constant will be different when the same filar micrometer is used on different telescopes but remains the same for different eyepieces on the same telescope. An accurate telescope drive is **essential** for using a micrometer.

The instrument in question has to date been very largely limited to professional observatories. However, Carroll and Bohannon, 3415 Santa Carlotta St., La Crescenta, Calif. now offer a filar micrometer **most suitable** for the amateur observer and especially for the serious lunar and planetary observer. Their advertisement has appeared upon our back outside cover in recent months; and they will be glad to furnish full specifications to anyone writing them. The Carroll and Bohannon micrometer differs from the usual observatory filar micrometer in being very light in weight and indeed is scarcely heavier than an ordinary eyepiece; therefore, no adjusting of weights on the telescope is necessary when it is attached. The amateur needs but a moment to slip out the eyepiece and slip in the micrometer. Nevertheless, the workmanship is excellent and attractive-looking. In place of a fixed and a movable wire the Carroll and Bohannon filar micrometer uses two movable, tapering needle-points. The lamp needed to illuminate them can be operated from a very small battery.

Now there are many lunar and planetary projects for which a filar micrometer is needed. We are most anxious to see many of our members work on such projects with this instrument. Doing so will give to our A.L.P.O. studies a quantitative precision often lacking so far. Therefore, we here suggest a few suitable projects. The list is very far from complete.

Everyone will be watching Mars next summer. Moreover, this apparition will be an excellent one for studying the spring melting of the south polar cap. Its size can be determined from the ratio of the diameter (long axis) of the cap to the diameter of Mars. These two quantities can each be measured with a filar micrometer, and the reduction of the measures does not require knowledge of the micrometer constant. The positions of various Martian features can be measured, greatest accuracy being realized in the central portions of the disc. It may prove helpful to set the needle-points to simulate a central meridian for estimating visual transits. Of course, the translation of measured positions into Martian latitudes and longitudes requires a knowledge of certain geometrical quantities, found in the **Ephemeris** from the date and time of the observation.

On Jupiter the filar micrometer may be used to measure the latitudes of belts, the centers of narrow belts and the north and south edges of wide belts. Here again one measures a ratio, that of the distance along the Jovian C.M. from the north (or south) limb to the belt in question to the polar diameter. The micrometer may also serve to measure longitudes by determining another ratio (and again one does not need to know the micrometer constant), and this method has the advantage over visual C.M. transits that it can be applied to objects not on the C.M. However, the needle-points might again help the visual observer to estimate such transits. What we have said about Jupiter applies also to Saturn. In addition, the amateur should measure the positions, and the widths if appreciable, of divisions in the rings other than Cassini's.

The phased outline of Venus has been found to be modified by the atmosphere of that planet, particularly near dichotomy. A micrometer may hence be used to determine the **observed** position of the center of the terminator by measuring the mid-limb to mid-terminator distance. When the planet is a thin crescent, its horns are greatly prolonged, even into a complete ring of light at times. Measures of the angular perimeter of the sunlit crescent can give quantitative data on the thickness of the optically effective layer of the Venusian atmosphere. My own procedure has been to set a wire tangent to the limb successively at the north cusp and the south cusp.

The moon is always with us, and here too the Carroll and Bohannon filar micrometer gives us opportunities. Even fundamental measures of the heights of lunar mountains and the diameters of lunar craters are needed. Those interested in such work will do best to cooperate with the Lunar Section of the British Astronomical Association. W. H. Pickering found that the white area around Linné (refer to pp. 166-168 of **The Strolling Astronomer** for December, 1953) varies in size, being largest near sunrise and dwindling until near lunar noon but enlarging again in the afternoon. This study of Linné could profitably be repeated now. Moreover, there are many other small craterlets surrounded by white areas; and we should study whether the size-changes in the Linné white area are imitated by the others. If so, perhaps the explanation is merely optical. In reducing the measures one must allow for the changing distance of the moon. During his exhaustive studies of Conon Elmer Reese has discovered very curious variations in the directions of some of the dark streaks. A filar micrometer is obviously the ideal instrument to study such changes.

We hope that we have said enough to indicate that the A.L.P.O. planetarian will find that a filar micrometer will make his studies both more valuable and much more varied. It should perhaps be mentioned in closing that measures with this instrument do not normally consist of single settings only but often of a large number. The mean of the set of measures is then taken as the most probable value, and statistical concepts can be used to determine its degree of precision. On a rotating planet it may be necessary to make the successive measures rapidly.

JUPITER'S SATELLITES 1953-54

BY D. P. AVIGLIANO

One of the major difficulties in recording details seen on very tiny discs, such as the satellites of Jupiter present, is drawing these details in their correct relative positions. This is probably best achieved by employing an **excellent** telescope of not less than 8" in aperture at rather high powers. The highest power that will still show the markings should be chosen as the larger the disc appears the easier will be the positioning of the details.

GANYMEDE. During the 1953-54 apparition of Jupiter it was possible to obtain quite a number of drawings of Ganymede and enough of these were obtained under excellent conditions to warrant the construction of a map (see Figure 7). The telescopes used were 8

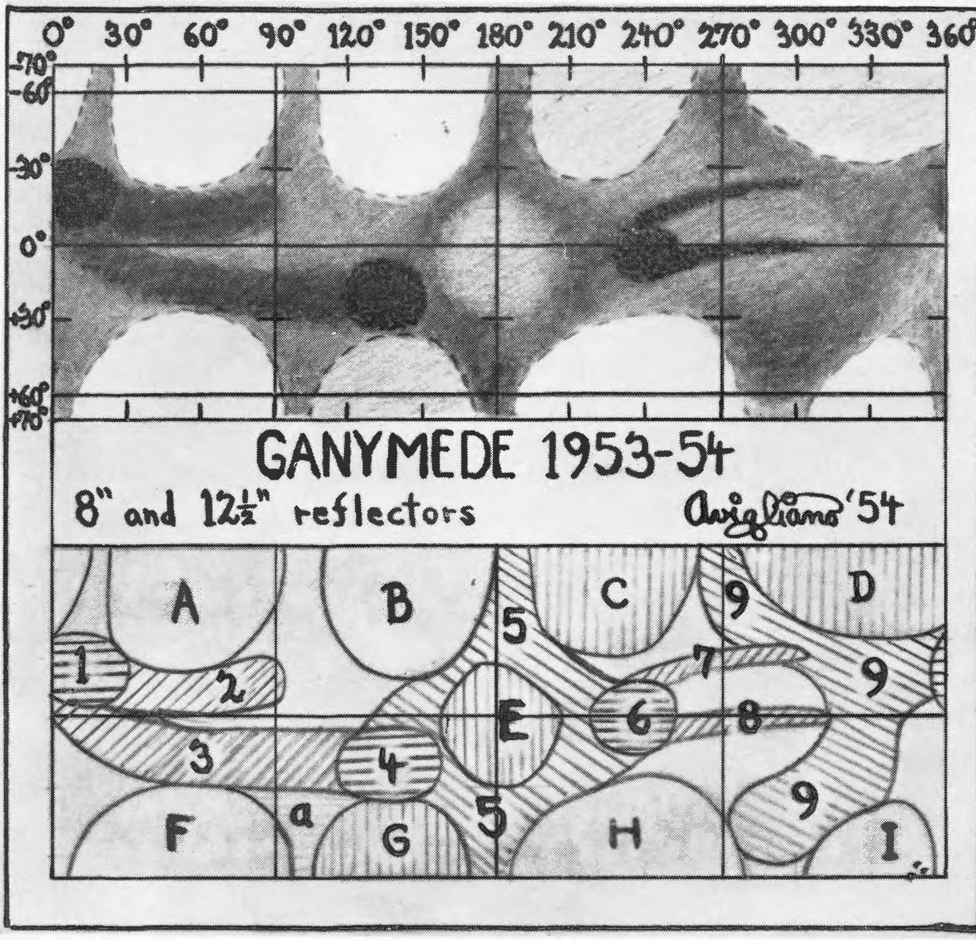


Figure 7. Map of Ganymede in 1953-54 by D. P. Avigliano.

and 12½ inch Newtonian reflectors, the mirrors by Thomas R. Cave, Jr. of the Cave Optical Co. The usual powers employed were 586 to 635 on the 8″ and 525 to 700 on the 12½″. The seeing conditions when detail capable of being drawn was observed varied from 4 to 7 on a scale of 10. Seeing conditions of 3 to 4 usually showed vague markings but the positioning of the markings was extremely difficult at seeing below 4.

Using the standard system of longitudes (in which it is assumed that Ganymede keeps the same face turned toward Jupiter) the central meredian of the satellite is 0° or 360° at superior conjunction, 180° at inferior conjunction, 90° at eastern elongation and 270° at western elongation. The main darker areas shown on the map were given numbers and the lighter areas were lettered. The map was then compared with the following 3 maps:

I. The 1943-45 Pic du Midi map[1]

II. Danjon's 1934 map[2]

III. Howe's composite map[3]

It was also compared with drawings or descriptions of drawings by the following observers: T. R. Cave, Jr., T. A. Cragg, W. H. Haas, L. T. Johnson, E. E. Hare, T. Saheki, E. J. Reese, E.E. Both and F. E. Brinckman.

Considering the difficulty of these observations some of the different observers agree in a most surprising manner on several of the areas and more vaguely on some of the others.

Dark spot 1—is present on all three comparison maps.

Dark area 2—is vaguely indicated on maps I and III and in some of the other observers' reports.

Dark area 3—is present in somewhat different forms on all three maps and in some of the other observers' reports.

Dark spot 4—is present on all three maps and in some of the other observers' reports.

Dark area 5—is present on maps II and III, in some of the other observers' reports and parts of it are indicated on map I.

Dark spot 6—is present on map I.

Dark streak 7—is present on map III, in some of the other observers' reports and possibly on map I.

Dark streak 8—is present on map III and in some of the other observers' reports.

Dark area 9—is partly present on maps II and III, in some of the other observers' reports and it is shown as being composed of finer details on map I.

Bright area A—is indicated in some of the other observers' reports.

Bright area B—is present on maps II and III, probably on map I and in some of the other observers' reports.

Light area C—is possibly indicated on maps II and III.

Light area D—is possibly indicated on map I and in some of the other observers' reports.

Light area E—is present on all three maps.

Bright area F—is present on map I, in some of the other observers' reports and possibly on map II.

Light area G—is present on maps I and III and possibly on map II.

Bright area H—is present on maps I and II.

Bright area I—is present on maps I and III, in some of the other observers' reports and it is present as a much larger area on map II.

Area a—is strongly indicated on map I.

From these results it would seem the dark spots 1 and 4 almost certainly exist as do probably the dark areas 3, 5 and 9. The bright cap B almost certainly exists as do probably the light areas E, G and I. The existence of the other areas in the general forms shown on the map is more uncertain although drawings have repeatedly been obtained by the writer of the bright caps A and F.

Large telescopes used under conditions of super-seeing are able to break down some of the areas noted into much finer details[1]. The writer feels that the usual 8 to 12-inch telescope of the more advanced amateur, if used on the finest nights and in the interval of approximately 2½ months before and 2½ months after each year's opposition of Jupiter, is capable of producing good results in the delineation of the more prominent features on Ganymede. If enough observers continue to draw Ganymede whenever possible it should **eventually** lead to a quite refined and reasonably accurate map of its surface.

On the clearest nights Satellite III was always seen to be white-yellow in color. The lighter caps were sometimes quite prominent (especially with the 12½"). When there was less transparency III took on a ruddy or pinkish tinge as did the other satellites.

CALLISTO. By far the most changeable of the four larger satellites of Jupiter is Callisto. Past observers have noted its changeability in both color and apparent size[4, 8]. Usually Sat. IV was observed to be nearly as large as Sat. III but on the following dates it was seen to be smaller than normal: Nov. 17, 1953; Jan. 2, Feb. 12 and Feb. 21, 1954. On Jan. 21, 1954 it was seen to be nearly as small as Sat. I, which was near it, the seeing being very good.

In color Callisto is rather dull but the variability of its tints is no less than astounding! A selection of color estimates made on the best nights follows:

Nov. 7, 1953—very pale greyish yellow-white
Nov. 16, 1953—dull greyish white
Jan. 15, 1954—blue-grey
Jan. 21, 1954—dull grey
Feb. 1, 1954—pale white-yellow with slight **ruddy** tinge, **no** blue or grey (transparency excellent at this observation).
Feb. 17, 1954—dull grey-white
Feb. 21, 1954—grey-white

The normal color of Callisto would seem to be a dull greyish-white; but the other colors when they are seen, and as has been remarked by other observers, are truly unusual.

On two occasions the edges of Callisto appeared diffuse when compared with the sharp edges of the other satellites: Jan. 15, 1954 at 6:05 U. T. and Jan. 21, 1954 at 5:30 U. T. The instrument employed was the 8″. This "fuzziness" of Callisto has been reported by other observers, notably Cave and Cragg.

Of the very few drawings of Callisto that were obtained in 1953-54 several are comparable to some earlier work by other observers. A drawing of Feb. 17, 1954—CM 35° shows the lighter N and S cap-like areas that are shown on drawings by Danjon (1934)[2] and the Pic du Midi observers (1941 and 1943-45).[1, 5]. A drawing of Nov. 7, 1953—CM 345° shows the lighter N and S areas and the generally darker area mostly on the preceding half of the disc that the Pic du Midi observers have shown (1941- and 1943-45)[1, 5]. A third drawing of Jan. 15, 1954—CM 40° shows the N and S lighter caps noted above on Feb. 17, and it also shows a darker border to the N cap that is shown by the Pic du Midi observers (1943-45)[1]. The 8″ was employed at 586X to 635X for these drawings.

The markings on Callisto are much more vague than those on Ganymede. This vagueness of the markings along with the occasionally seen diffuseness of its edges and the changeability in its color and apparent size may add some evidence to the idea that this satellite might possess an atmosphere.[6] For the markings on Callisto to become apparent not only excellent seeing is required but also **exceptional** transparency. On the few nights per year possessing these qualities the experienced amateur could do worse than turn his telescope on Callisto. If the markings are not seen work could be done on the changes in the satellite's color and size.

Io. On Feb. 17, 1954, with the 8″ reflector, it was my good fortune to observe Sat. I through an entire transit with the seeing at 7 at its ingress and 5 at its egress. The satellite at ingress appeared as a tiny very round glowing white pearl against the dull ruddy background of Jupiter's limb. When the satellite was about one-half of its diameter on the disc of Jupiter (3:40 U. T.) the N and S limbs of the satellite appeared to be duskier than its center (586X); a power of 700X was then applied, and the N and S "polar" areas of Io were easily seen as shaded while the "equatorial" zone was light. The entire disc of the satellite was seen in front of the background of Jupiter's limb area. The lighter "equatorial" zone was at a slight angle to the direction of the dark belts on Jupiter, and the N shaded "polar" area appeared slightly wider and darker than the one on the S. As the satellite continued its transit, the shaded areas became more difficult to detect; and finally the satellite could no longer be detected as it blended with its background. The shadow of I in transit appeared very black and very round. An attempt to re-observe the markings was made at the satellite's egress, but only the slightest trace of duskier N and S limbs was apparent.

In transits of Sat. I the general behavior of this satellite was as follows: it comes on to the disc of Jupiter as a light spot, disappears in about 20 minutes by blending with its background, then soon reappears as a dark spot gradually turning darker as it nears the CM of Jupiter This process takes place in reverse as the satellite makes its egress. At its darkest it is darker than any of the spots in the dark belts on Jupiter, but it is not nearly so dark as a satellite shadow in transit. These observations would seem to confirm some of the earlier observations of Io in transit, particularly those of Molesworth.[7]

In all but one of the dark transits of Io that were watched near opposition in 1953-54 the satellite appeared as very round. On March 5, 3:00 U. T. (8″ at 290X) the dark satellite in transit was seen to be elongated in a N and S direction.

During these observations absolutely no markings were detected on Io when it was off the disc of Jupiter and only once were markings seen while it was in transit (above). To observe the shaded zones on this satellite with the usual amateur instrument the seeing must rise to near perfection at just exactly the time when Io, at transit ingress or egress, and its background present just the right degree of contrast; the hope that such will happen is indeed almost nil as anyone who has "sat up" with Io watching it at ingress and egress will tell you. To observe the N to S streaks that cross the lighter "equatorial" zone of Io that observers with large instruments have sometimes discerned would probably take telescopes larger than 12 inches used under conditions of super-seeing.[1, 5, 8]

The color of Io was usually noted as white.

EUROPA. If the disc of Io provides a somewhat unhappy hunting ground for the amateur, the disc of Europa provides one that is almost completely barren. Although numerous attempts were made no markings at all at any time were even suspected on Europa. For serious work on the two smaller satellites of Jupiter, Io and Europa, it would seem that telescopes larger than 12 inches are needed; and these are to be used only in the areas of finer seeing.[1, 5]

The usual color of Sat. II was a yellow-white.

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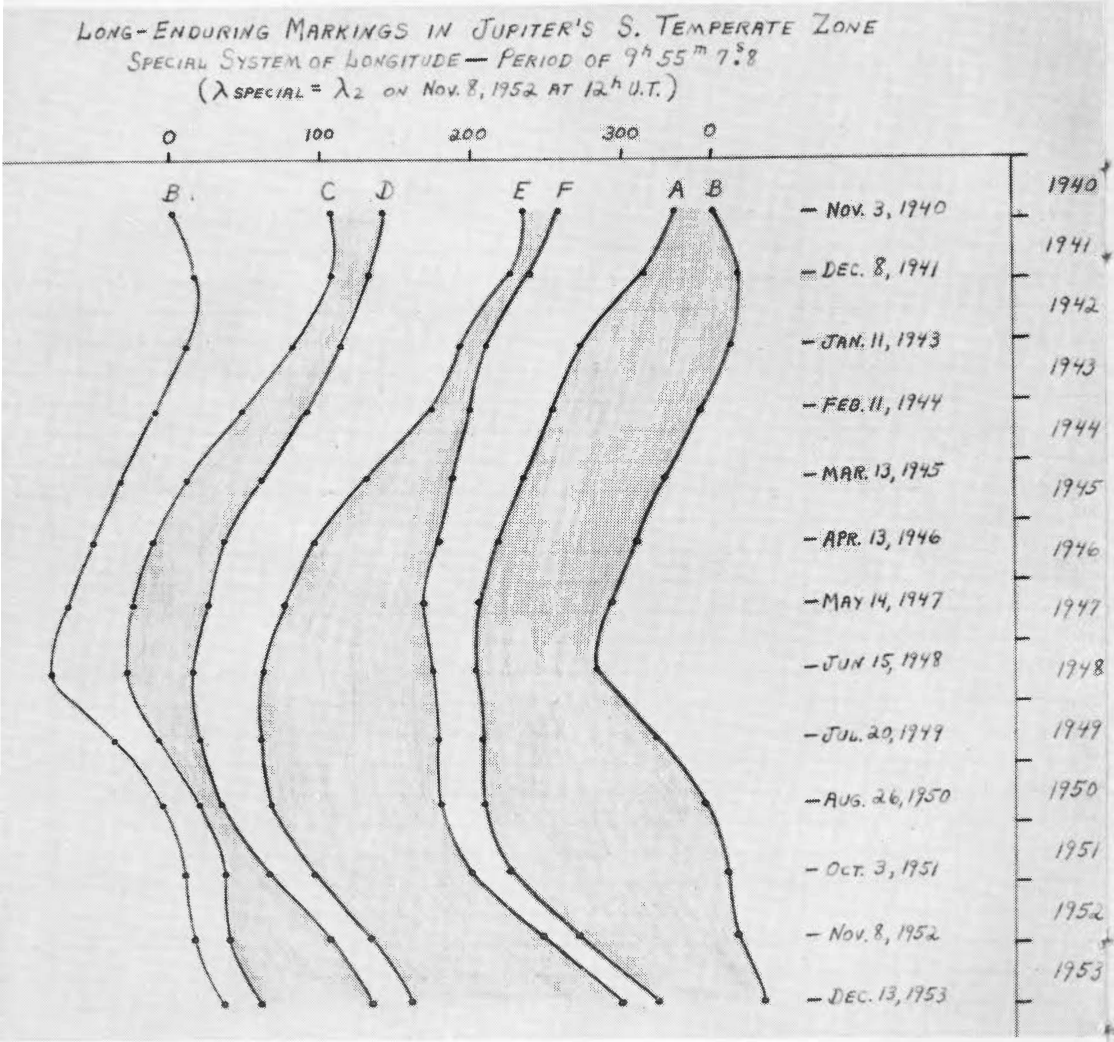
FURTHER NOTES ON THE LONG-ENDURING MARKINGS IN THE SOUTH TEMPERATE ZONE OF JUPITER

In **The Strolling Astronomer,** Vol. 6, pp. 33-35, 46, and 53, March and April, 1952, we reported some valuable studies by Mr. Elmer J. Reese of some very long-lasting brighter sections of the South Temperate Zone observed from 1940 to 1951. Mr. Reese has now brought this study to the end of 1953, and the graph on page 16 will show the rotation-drifts



of these markings during the 13 years of their existence. Because the markings have made many circumnavigations of Jupiter relative to the System II of longitude the graph is drawn for a special system of longitude which was equal to System II at 12^h, U. T., on November 8, 1952 and which has an arbitrary rotation-period close to the average rotation-period of these South Temperate Zone objects. The letters A-B, C-D, and E-F are simply convenient designations for three dusky sections of the zone; and naturally B-C, D-E, and F-A are then the intervening brighter sections. The following table gives the average rotation-period of the markings between oppositions:

Interval	Period of Rotation
Nov. 3, 1940 - Dec. 8, 1941	$9^h\ 55^m\ 7^s.5$
Dec. 8, 1941 - Jan. 11, 1943	5.2
Jan. 11, 1943 - Feb. 11, 1944	5.2
Feb. 11, 1944 - March 13, 1945	5.1
March 13, 1945 - April 13, 1946	5.5
April 13, 1946 - May 14, 1947	5.9
May 14, 1947 - June 15, 1948	6.8
June 15, 1948 - July 20 1,949	9.1
July 20, 1949 - Aug. 26, 1950	9.2
Aug. 26, 1950 - Oct. 3, 1951	10.0
Oct. 3, 1951 - Nov. 8, 1952	11.0
Nov. 8, 1952 - Dec. 13, 1953	11.3

On December 13, 1953, the date of the last opposition of Jupiter, the different markings had these longitudes by System II: A—1°, B—72°, C—97°, D—171°, E—198°, and F—337°. These longitudes (II) were decreasing at the rate of 21 degrees per 30 days, from which drift the longitudes at other times during the 1953-54 apparition can easily be found. A.L.P.O. members will wish to search for these features after the 1954 conjunction of Jupiter with the sun. They have already become much the longest-lived objects ever recorded on the Giant Planet apart from the Red Spot region and the South Tropical Disturbance of 1901-40.

FOR THE OBSERVER: MARS IN 1954

BY D. P. AVIGLIANO

As Mars is now approaching its rather close 1954 apparition a few words both to the beginner and to the more advanced visual observer would seem to be in order. We begin with some data pertinent to the current apparition.-[1], [2], [3]

Terrestrial dates—1954	Equivalent Martian date	Apparent diameter	Approx. magnitude
Apr. 15	Feb. 15	11″.27	—0.1
May 12	Mar. 1	14″.94	—1.0
June 6	Mar. 15	19″.44	—1.9
July 6	Apr. 1	21″.83	—2.1
July 28	Apr. 15	19″.84	—1.7
Aug. 23	May 1	16″.18	—1.3
Sept. 14	May 15	13″.49	—0.7
Oct. 9	June 1	11″.22	—0.3
Oct. 30	June 15	9″.60	0.0
Nov. 25	July 1	8″.11	+0.4
Dec. 16	July 15	7″.19	+0.7

Opposition occurs on June 24 and the planet presents its largest diameter on
Aug. 23 May 1 16".18 —1.3
July 2 (21″.88). As Mars is in southern declination (—28°22′ on July 20th.) observations from the northern hemisphere may at times prove difficult but by perseverance the amateur should be able to obtain a fair amount of very usable observations.

FOR THE BEGINNER. A telescope of good optical quality should be used. Its size may be anything from 3″ in aperture upwards. For best general results and somewhat detailed views a 6″ to 8″ instrument should prove quite adequate. Telescopes larger than 8″ used under improved seeing conditions will of course give more detailed views while telescopes under 6″ are usable for the delineation of the larger more general areas seen on the planet, especially when it is near opposition. For color studies the largest reflector that it is possible to obtain should be used although under good conditions a comparatively small reflector will bring out the planet's colors very well. The powers to use will depend to a great extent on the seeing conditions prevailing at the time of each observation but given good conditions rather high powers seem to give the best results on Mars. As Mr. Clyde W. Tombaugh has pointed out powers of not less than 30 per inch of aperture should be used.[4] With the smaller apertures higher powers per inch (up to about 50 or 60) can be used under good conditions but some trouble might be encountered with the larger instruments at 30X to 50X per inch of aperture, for powers of 375 to 625 on a 12½″ telescope require very good seeing. Neutral density or yellow color filters used over the eyepiece may prove beneficial in reducing the glare, especially at lower powers and with the larger instruments. Yellow or amber filters may also improve the contrast between the orange and greenish markings on the planet's disk.[4]

For color studies of Mars a reflector should always be used. Here we can use a somewhat lower power per inch of aperture but we must choose an eyepiece capable of giving sufficient enlargement to the planet's disk **when it is growing smaller in size.** The reason for this is that the **same** eyepiece, preferably an orthoscopic or equally achromatic type, should be used on the **same** reflector for all color studies throughout the apparition. If this is not done any color or intensity changes that have been noted during the apparition will not be valid for comparison. A power of around 20 or 25 per inch on amateur sized instruments should prove adequate and thus it is apparent that the proper magnification of the disk for color studies is more easily obtained with the larger telescopes. When making any studies of colors on Mars (or any other planet for that matter) the night should be very clear and dark, the planet at its highest possible altitude above the horizon, the image of the planet should be centered in the field of the eyepiece and the observer's eye should look straight through the center of the eyepiece, not at an angle. All this is done to avoid false colors. Any observations of colors that are obviously on the planet made with **any** size instruments at **any** powers should of course be reported. The above instructions pertain to a specific study of the colors and their changes. Using a set of different colored filters may help in ascertaining the more exact hue of an area. Refer to an article by James C. Bartlett, Jr. for more information on the use of color filters.[5]

REPORTING OBSERVATIONS. The report of the observations made should take the form of either drawings, written pages or both. The drawings should be made and finished if possible at the telescope. A clip board with a dim light attached makes a good drawing surface. The light should be covered with red tissue or cellophane so that the eye will not be dazzled by white light. Full disk drawings should be around 2 inches in diameter when the planet is at its nearest and somewhat smaller if desired when Mars presents a smaller disk. Drawings should be made as often as possible and these along with any other reports should be sent to your Recorder at frequent intervals during the apparition. If the material is sent regularly on the first of each month it will enable prompt evaluation and reporting of the observations.

With all of the reports and drawings should be noted the usual items: observer's name, address, date and time of observation (in Universal Time if possible), size and type of telescope, power or powers used, seeing conditions (on the scale of 0 worst to 10 best), transparency conditions (on a scale of 1 to 5) and any other helpful data such as filters if used, etc.

WHAT TO OBSERVE. Pertaining to what the amateur can and should endeavor to observe on Mars we can do no better than quote from a paper distributed by The Mars Committee.[6] Under the heading "Visual Observations" we find:

"a. New determination of diameter and oblateness of Mars.

"b. Study of cloud phenomena and their motions, and close watch for projections.

"c. Study of the nature, structure and intensity of surface markings.

"d. Study of the rate of melting, and the behavior of polar caps.

"e. Studies of secular and seasonal changes in dark markings."

Items "b" to "e" are well within the capabilities of a fairly well-equipped amateur of some experience. In regard to "b" the detection of any visual "whitish" or "yellowish" clouds or obscurations over any areas of the planet are important. Frequent well-made drawings along with observational notes are the best methods of study of the above items. Every effort should be made to observe projecting clouds at the limb or terminator on successive dates.

Canals, a subject dear to the hearts of observers of Mars, are best seen **later** in the apparition. The dates of best canal visibility, according to Dr. Edison Pettit, occur from about Martian April 1 to about Martian June 15 (see column 2 of the data table).[1] If any canals are observed by our members an effort should be made to draw them as nearly as possible **exactly as they are seen** whether this be diffuse, sharp, narrow, wide, continuous, broken, straight, curving or what have you. The **correct** placement of the canals on the drawings in the positions they are seen to occupy is very important. Also if the good seeing continues a drawing of the same canals after the planet has rotated somewhat might be important. To those observers placed in favorable localities a network appearance of the canals may become visible momentarily in the intervals of finest seeing, the best dates for observing this phenomenon being between Martian April 20 and Martian May 20.[1] Written descriptions should accompany any canal observations.

THE MARS COMMITTEE. This committee was formed at the Lowell Observatory for the purpose of international cooperative study of Mars at its coming apparitions. While most of the work turned in to the committee will be of a professional nature an important part of the visual program will be the constant surveillance of the planet by experienced amateur observers. In charge of amateur contributions for The Mars Committee will be Colonel Dinsmore Alter of the Griffith Observatory and Mr. Thomas R. Cave, Jr. of Long Beach, California. I, as Recorder, will make available to The Mars Committee all A.L.P.O. work of a worthy nature, so here is probably the best chance the more advanced A.L.P.O. observers will ever have to make important contributions to the astronomy of Mars. The contributions by overseas members of the A.L.P.O. become very important in our efforts to keep the planet under as constant scrutiny as possible.

All observation drawings and reports should be sent to this Recorder:

D. P. Avigliano
678 West Manzanita Avenue
Sierra Madre, California

Let me close with both a word of encouragement and a warning. Even though you might be a beginner and posesss as small an instrument as one of only 3 inches aperture, persistence will enable you to see more than your first views of the planet would indicate as possible. What experience you gain at this apparition will prepare you well for serious work at the 1956 apparition when possibly you will be the proud owner of a larger instrument.

The warning is to draw only what you definitely **do** see and not what you think you **should** see. At times that which is obscured and can **not** be seen is as important as what can be seen.

The writer wishes to thank Dr. Edison Pettit for permission to use parts of one of his articles on Mars, Mr. Thomas R. Cave, Jr. for kindly supplying some of the information on The Mars Committee and Mr. Walter H. Haas for the loan of the material listed as reference No. 6.

Any and all observation reports on Mars received will be most appreciated.

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FOR THE BEGINNER:

An Appeal for Observations Of Saturn

BY THOMAS A. CRAGG AND WALTER H. HAAS

During 1953 there were perhaps the smallest number of contributing observers of the planet Saturn than in any apparition since the inception of the A. L.P.O. Apparently many members looked at our ringed neighbor but failed to make drawings or to report their findings. It is hoped that during the 1954 apparition now in progress more observations will be received. There follows a short resumé of some of the items of interest which might be pursued.

Ball. Recently it has been learned that some of the European observers have found a series of bright clouds appearing in high northern latitudes. As has been pointed out previously, our sole knowledge of rotation-rates in these latitudes is spectroscopic (**The Strolling Astronomer,** Vol. 7, No. 4, pg. 53, 1953). It would be most desirable to have visual evidence of the rate there. It should be remembered that the probable rotation rate north of latitude 50° N. is in excess of 11 hours. Rotation rates may be determined with considerable accuracy by the method of visual central meridian transits described in **The Strolling Astronomer,** Vol. 7, No. 7, pg. 96, 1953. Of course, central meridian transits ought to be observed not just of the far northern bright clouds referred to above but also of all suitable features in all portions of the ball; however, more is known of the rotation of the equatorial region of Saturn than of higher latitudes.

Drawings of the planet should also be made; and here the precepts outlined in **The Strolling Astronomer,** Vol. 7, No. 6, pg. 87, 1953 should be helpful—at least the Editor hopes so! It may be worthwhile to construct an outline of the ball and rings from data in the 1954 **Ephemeris** (or other similar source) before going to the telescope. The same outline can be used for about two weeks without causing appreciable positional errors in drawing. One will want to know, of course, the nomenclature of the ball and rings. This information is given on Fig. 1 on pg. 158 of **The Strolling Astronomer** for November, 1952. Of course, the north pole of the planet is now tipped toward the earth by a much larger angle than in 1952. Generally speaking, the Saturnian terminology of dark belts and bright zones is very similar to the Jovian.

Observations of the brightnesses (or intensities) of the different belts and zones and also of their colors can be of value if they are made regularly and carefully. Standard color filters of known transmissivities at different wave-lengths may be very useful in securing reliable impressions of Saturnian colors. For example, a red belt will look lightest in a red filter, much darker in a blue filter. Intensities are best estimated on some kind of numerical scale. The B.A.A. Saturn Section has employed a scale running from zero for black shadows to ten for the most brilliant marks. Without doubt different individual observers will vary in the exact numerical intensity they will find for a given belt or zone on such a scale; but with practice any observer can achieve internal consistency in his own set of estimates, and certainly it is more accurate to use a numerical scale than merely to speak of "fairly bright" zones or "very dark" belts. Naturally, a belt or zone is not always of exactly the same color and intensity in all its parts. Finally, it should be realized that the Saturnian belts and zones will vary in color and intensity from time to time. Indeed, observations of this kind sustained over a period of years might even discover some Saturnian seasonal variations.

Rings. In the rings the Third and Fourth Divisions, which are 1/3 and 2/3 respectively of the way from the inner edge of Ring B to its outer edge, are suspected of being merely contrast- effects at the edges of concentric shadings in Ring B. Observations of these apparent divisions with large telescopes might be very interesting and instructive. The position of the inner edge of the Crape Ring (Ring C) should be estimated because some variation here has been recorded in the past. Still better, equipped observers should measure the position of the inner edge of the Crape Ring with a filar micrometer. Careful observations of **any** divisions in the rings other than Cassini's are desired; and their positions, widths, and intensities should be closely observed. Some such "divisions" may be gray concentric shadings in the rings rather than black gaps.

Shadows. The shadow of the ball on the rings should be observed very closely since occasional apparent notches or lumps here may supply information about the relative brightnesses of various portions of the rings. At opposition the shadow of the ball on the rings disappears for a short interval, and it is a fine test for telescopes of various sizes to determine how near to opposition the shadow can be detected. Moreover, the shadow of the rings on the ball will be of zero width when the sun and the earth have equal Saturnicentric latitudes on April 19, 1954; and near that date it will be very narrow and will similarly test the optical quality of telescopes of different apertures. On several occasions the ring has been seen within the shadow of the ball, being brighter than the background sky. Observers are also reminded of the occasional reports of a dusky, semi-transparent ring to the **outside** of Ring A, the outer of the two bright rings. Large telescopes will have an advantage in searches for this "outer Crape Ring".

Satellites. Here is a program which would be of great value if a sufficient number of observations were made. Even step-estimates of the brightness of each satellite in terms of the brightness of Titan have value. For example, the record:

Titan 5 Iapetus 7 Rhea 2 Tethys 1 Dione would mean that satellite Titan was five "steps" brighter than satellite Iapetus, which in turn was seven "steps" brighter than Rhea, etc. Here the "step" is the smallest observable difference in brightness and is likely to be about one-tenth of a stellar magnitude. Of course, those possessing visual photometers or photographic or photo-electric equipment can undertake more refined studies of the satellite-brightnesses. Probably Iapetus should be followed especially closely since its variation in light is the greatest. In past years observations of the brightnesses of the satellites have not been numerous enough to be of very great value.

Saturn will be at opposition on April 26, 1954 and will be well placed for study in the evening sky from early April until early August. The rings will be tipped toward the earth by 18 degrees on the date of opposition, with their north face being the visible one, and will thus be more widely opened than since 1947. The declination of the planet will be 11°S. on April 26 so that observers in high northern latitudes will be handicapped somewhat in its study. In the British Isles, in fact, the planet cannot be seen on a fully dark sky at all during the long summer twilights; and our B.A.A. friends are hence requesting increased attention to Saturn from observers in more southerly latitudes. It might further be pointed out that there will be an unusually favorable apparition of Mars in 1954, and perhaps the incentive to study two planets at one sitting will afford us enough observations of Saturn to allow more comprehensive reports.

A NEW RING AROUND SATURN?

BY THOMAS A. CRAGG

Several observers in recent years have mentioned seeing a faint dusky ring outside the bounds normally ascribed to Ring A. T. R. Cave, Jr. and T. A. Cragg (12½″ and 12″ reflectors respectively) in this country and R. M. Baum in England are ones seeing it on several occasions in 1953. R. M. Baum, in an article to appear in "The Strolling Astronomer," has found some valuable old observations of the French in 1907 relating to this exterior ring.[1]

Recent concern over this feature started in a conversation with Cave early in 1952 with a casual mention to the effect that he had seen a ring outside Ring A. Mention of this ring as a possible clue to the dusky edge of the ring where it crossed the ball was made in mid-1952.[2] During the 1952 apparition of Saturn, Cave and Cragg **suspected** such a ring at the ansae on three different occasions.[3] Subsequent correspondence with R. M. Baum finds that he observed this ring with instruments from 3″ to 9″ aperture in 1953. Cave and Cragg also observed this ring on a few occasions with their 12″ reflectors in 1953.

Since these observations, interest in this ring has been rising exponentially! It is conceivable that photoelectric observations for the detection of this ring may be attempted before too long at Mt. Wilson. It is therefore of the utmost importance that the A.L.P.O. make an all-out effort to observe this ring so that adequate data may be supplied to the photoelectric observer.

Members with smaller instruments ARE capable of contributing to this work as the observations of R. M. Baum will testify. A suggested criterion, however, is that unless the Crape Ring is reasonably easy at the ansae, the dusky ring outside of Ring A will probably be invisible.

This ring as seen by Cragg would bear the following description:

1. Duskier than the Crape Ring, about 2/3 as bright.
2. About 1/3 to ½ as wide as the Crape Ring.
3. Brightest portion about 2/3 the way out.
4. Apparently joined to Ring A without a division.
5. No divisions so far found on the outer dusky ring.

Let's hope we get some observations of this elusive ring, especially from those observers with larger telescopes.

REFERENCES

1. Private Communication from R. M. Baum, March, 1954.
2. **The Strolling Astronomer,** Volume 6, pg. 69, May 1952.
3. **The Strolling Astronomer,** Volume 6, pg. 160, Nov. 1952.

Other References to Outer Dusky Ring: **Vega,** Nos. 12 and 13, pg. 52, January 31, 1954.

Further References to Excellent Saturn Articles:

1. **The Journal of the British Astronomical Association,** "Saturn in 1952-53", Volume 64, pg. 23, M.B.B. Heath, December 1953.
2. **The Journal of the British Astronomical Association,** "Saturn's Rings — Minor Divisions and Kirkwood's Gaps", Volume 64, pg. 26, A.F.O.'D. Alexander, December 1953.
3. **Vega,** "Observations of Saturn", Nos. 12 and 13, G. D. Roth, January 31, 1954.

BOOK REVIEW

BY JAMES C. BARTLETT, JR.

Der Sternenhimmel 1954. Edited by Robert A. Naef, Swiss Astronomical Society; 118 pages. H. R. Sauerlander & Co., Aarau, Switzerland. Obtainable on order through Mr. Albert J. Phiebig, 545 Fifth Ave., New York (17), N. Y. Price 6.95 Swiss francs or U. S. $1.66 at current quotations.

The Starry Sky is one of the most attractive observing manuals to come our way in some time. Described as "A Small Astronomical Year Book", this concise volume nevertheless manages to include an astonishing wealth of data in almost every field of astronomical interest.

Beginning with a generalized table of celestial phenomena for 1954, one is introduced to the plan and purpose of the book and so by easy stages into brief discussions of important astronomical elements with notes on the motions, librations, and tables of the moon, solar elements, planetary apparitions for 1954, use of the star charts, and so on.

After this pleasant introduction, the **Jahrbuch** settles down into comprehensive monthly chapters each of which includes an astronomical calendar of phenomena with separate notes on sun, moon, planets, asteroids, meteor showers, interesting stellar objects including variable stars, and even the positions of the zodiacal light when favorably placed.

Associated with these monthly divisions are six full-sky star maps covering the twelve months of the year. A novice may here be dismayed by the substitution of key numbers for the regular constellation names (to avoid typographical clutter); but he has only to turn to the relevant appendix to find each number related to its proper constellation.

Incidentally, a pleasant feature of this appendix is the giving of the familiar Latin equivalents wherever the constellation name differs in German. Thus one learns that **Einhorn** (literally "One horn") is our old friend, **Monoceros,** the Unicorn; and while **Jungfrau** can hardly be mistaken for anything but a Virgin, one perhaps might never suspect that **Jagdhunde** are simply the Hunting Dogs, **Canes Venatici.** Thus one gets in a little philology with his astronomizing.

Der Sternenhimmel is distinguished by many excellent charts, including a novel one showing at one glance the phase of the moon and the apparent path of a given star at its occultation. There is also a large graphic chart of celestial phenomena for 1954; charts of the apparent paths of Mars, Jupiter, Saturn, Uranus and Neptune among the stars; a clear map of the surface of Mars with names of the principal features; and a large outline map of the moon with key to the formations. This last includes the larger rill systems. The moon map, however, is for an erected image which may cause some difficulties for the telescopist without a terrestrial eyepiece, but should be a corresponding boon for those limited to prism binoculars of 7x and upward.

The numerous tables include ephemerides of the sun, moon, and planets (including Pluto) and for the brighter asteroids, Ceres, Pallas, Juno, and Vesta. For sunspot observers there are graphic representations of the apparent paths of the spots for each month of the year, together with the position angles of the sun's axis and the approximate heliographic latitudes of the center of the disc. Separate charts and tables give complete data on lunar and solar eclipses, and among the miscellaneous tables are those for the position of the ecliptic, Julian Day, Central Meridian of Mars and Jupiter, Jovian satellite eclipses, Saturn's ring system, elements of the solar system, and many others.

An important feature, sure to find favor with beginners, is a brief but substantial glossary of astronomical terms and conceptions used in the text. There is even a Greek alphabet for those not too familiar with the Bayer designations for the brighter stars, and a simple Star Finder by means of which the tyro can find his way about the sky to various interesting objects.

Mention must also be made of a seven-page observer's catalogue of stellar objects, including nebulae, variables, doubles and stars of principal brightness and interest. This is arranged alphabetically by constellation, with data on the months of visibility, position of the principal objects in right ascension and declination, apparent magnitudes and spectral classes. Accompanying notes give such data as the diameter and brightness of the star, in terms of the sun's diameter and brightness; absolute magnitude;

surface temperature; distance, etc. For variables there is added the period, apparent magnitude range, type, and date of maximum for the long-period variables. Data for nebulae include the type, apparent diameter, distance, and spectral class where these are known. Abbreviations used in the catalogue are fully explained in the end paper.

Der Sternenhimmel is well printed in clear type on a good grade of semi-slick paper and was designed for rapid and easy use. The presentation of subject is orderly and logical, and the text is graced by a number of fine illustrations in addition to the numerous charts mentioned above. Editor Naef has succeeded in compressing a wealth of highly usable data into a handy compass.

Unfortunately too few American observers are sufficiently at home in German to mine this little Year Book to fullest advantage; but even if one has to spell his way about with the clumsy aid of a bilingual dictionary the effort will be well worthwhile. For those who read the language, **Der Sternenhimmel** will prove an indispensable companion in the observatory or out under the starry sky itself.

OBSERVATIONS and COMMENTS

R. M. Baum of Chester, England has recently directed attention to a little known facet of the Linné controversy. In the early nineteenth century several selenographers, including Maedler, saw Linné as a conspicuous crater 6 miles in diameter. It was last so seen by Schmidt in 1843. In 1866 Schmidt announced that Linné had vanished. There resulted a considerable revival of interest in the moon, and many drawings were made of Linné and its environs. The different observers were often in disagreement with each other, but none of them succeeded in recovering any easy crater 6 miles in diameter. The reported change has been debated at great length to the present day. Now Baum calls attention to a little-known paper by Maedler called "On Changes of the Moon's Surface," published in **The Astronomical Register** in 1868. After stressing the great rarity of lunar changes, Maedler goes on to accept the Linné change as real and then gives a personal observation: "My eye, which has recently undergone an operation for cataract, will no longer permit me to make accurate and special continuous observations, yet on the 10th of May, 1867, I attempted an observation of the crater Linné in the heliometer of the University of Bonn. I found it shaped exactly, and with the same throw of shadow, as I remember to have seen it in 1831. The event, of whatever nature it may have been, must have passed away without leaving any trace observable by me." Mr. Baum regards this paper as a very important contribution to the Linné discussion and concludes "that in the light of Maedler's statement all the 1866 observers were mistaken in their identification and that no change ever took place in Linné."

Mr. David P. Barcroft, who has an extensive private library of old lunar works, is more doubtful that Maedler's paper is of decisive importance. He points out that Maedler apparently depended wholly upon his memory in comparing the 1831 and 1867 appearances. He says nothing of referring to his old notes and drawings. Mr. Barcroft asks: "Who of us will be able to **remember 36 years from now** exactly what appearance we are now witnessing in some small formation which is currently under observation?" Mr. Barcroft thinks that a serious weakness of Schmidt's claim for a change is that he made the announcement in 1866, while his last previous observation had been in 1843. There is an excellent discussion of the Linné problem on pp. 185-192 of E. Neison's **Moon.**