ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS

The Strolling Astronomer

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In This Issue

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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.

S T A F F

ANNOUNCEMENTS

ERRORS IN JANUARY, 1953 ISSUE. Pg. 12, left column, bottom line: Read "craterlet 13". Pg. 13, left column, line 31: Read "The arrow on Figure 4..." Pg. 13, right column, line 5: Omit "half" after "western". Pg. 14, Figures 5 and 6: These have south at the right and west at the top and thus are not in the customary astronomical orientation.

SPECIAL OFFER OF THE WILKINS MAP OF THE MOON. We remind our readers of our offer of the Wilkins map, Second Edition (1946), as a booklet at a special price with new subscriptions and renewals. For four dollars we supply the map and a one-year subscription, either new or a renewal. For six dollars we supply the map and a two-year subscription, either new or a renewal. The map is on the reduced scale published in THE STROLLING ASTRONOMER of about 38 inches to the moon's diameter. Although this version of the Wilkins map is not so detailed as the later Third Edition, it will still serve the needs of all but the lunar specialist. Also, the pages in the booklet are a very convenient size, 8½ by 11 inches, for use at the telescope. Each section of the published map, including the special ones, is on a separate page in the booklet.

ACKNOWLEDGEMENTS. We thank all our many readers who wrote in to express their opinion of our new layout. It appears to be well liked by almost everyone, for which we are glad. The new kind of print and the placing of illustrations near the pertinent text in particular have received favorable comment.

PERSONAL. The Editor found it impossible to work on the March issue while his job required him to spend several weeks at the Aberdeen Proving Ground in February and March. We regret that the March issue will hence be very late in reaching our readers. We shall do our best to get back on schedule soon. The Editor much enjoyed meeting a number of astronomical friends and colleagues on the East Coast and is sorry that available time was too short to permit him to meet or renew acquaintances with many others.

A PROPOSED NEW FEATURE. We have been thinking about introducing a new feature in THE STROLLING ASTRONOMER, a section for beginners and new observers. It would deal with such elementary matters as computing colongitude, terminology, what to record with each observation, what kinds of observations are needed with each planet, etc. Though presumably of little interest to our regular observers, such a feature might be of some assistance to novices. We should like to hear from our readers what they think of such a section for beginning planetarians, for we naturally wish to supply the material that our readers want.

HARRY L. FREEMAN, 1888-1953

by L. F. Mawhinney

Harry L. Freeman, longtime amateur astronomer and maker of telescopes and accessories, died at the veterans' hospital in Sawtelle (los angeles) Calif. Feb. 27th, 1953, of a heart attack. He was 64 years old.

He was a past president of the Los Angeles Astronomical Society, serving as secretary-treasurer of that organization for three years. At the time of his death he was a director of the Astronomical Society of the Pacific, and a member of the Board of Western Amateur Astronomers.

Mr. Freeman was born in Detroit, Mich. Sept. 5, 1888. During a busy life in which he had been Foreign Sales Manager in the Far East and Pacific area for Caterpillar Tractor Company, a captain in the army during the first world war, and a civilian advisor in World War Two, he maintained a keen interest in astronomy. He completed his first telescope, a 7 1/2-inch reflector, in 1931, thereafter making many others. For a number of years he has operated a telescope-making and supply business in Los Angeles. He gave countless hours of his time to the telescope-making activities of the L.A.A.S. and was responsible for interesting scores of people in the scientific hobby.

He is survived by a son, Thomas Freeman of Burlingame, Calif., and two daughters, Mrs. Mae Jo Sanguinetti of San Diego, Calif., and Mrs. June Huber of Cincinnati, O.

[The staff of THE STROLLING ASTRONOMER extends its deep sympathy to the family of Mr. Freeman. To those of us who knew him his passing is a keenly felt personal loss, and the future Conventions of Western Amateurs will not be the same without him. - Editor.]

SIXTH ANNIVERSARY OF THE A.L.P.O.

by Walter H. Haas

With this issue of THE STROLLING ASTRONOMER we complete our sixth year of publication. It was in March 1947 that our first issue was released to an unsuspecting world. It is very gratifying that the following "charter members" are still with us. D. P. Barcroft, A. Boivin, G. Brown, R.N. Buckstaff, T. Connors, C.M. Cyrus, H. Dall, C.A. Federer, J.Q. Gant, Jr., F.M. Garland, W.H. Haas, T. R. Hake, (Miss) A. I. Hoth, L. T. Johnson, L. La Paz, R.C. Maag, R. Missert, O.E. Monning, R. L. Moore, A. W. Mount, J. J. O'Neill, E. J. Reese, C. P. Richards, D. W. Rosebrugh, M. Rosenkotter, N. J. Schell, E. A. Sill, J. R. Smith, H. D. Thomas, C. W. Tombaugh, F. R. Vaughn, Jr., E. K. White, H. P. Wilkins, and the Yakima Amateur Astronomers.

We are proud that we have grown during the last six years. In the spring of 1947 we had only a few dozen members, almost all in the United States and Canada; now we count almost 350 members distributed over the whole world. We have more members in California than in any other state and more in Los Angeles County than in any other metropolitan area - we may expect to be annexed any day now! Seriously, we have been very gratified at the cooperation and contributions received from many different colleagues in many different foreign countries. The assistance given by astronomical friends in England, Japan, Germany, Canada, France, Argentina, Spain, and other countries has been invaluable. Over the years we have been able to expand our services to our readers. In February, 1950 we began to publish lunar and planetary drawings with amateur instruments. We know of no other periodical in the English language which does so regularly. In August, 1950 we began to carry advertisements. In January, 1953 we adopted the present format of THE STROLLING ASTRONOMER.

It should probably be mentioned that membership in the Association of Lunar and Planetary Observers, carrying with it a subscription to THE STROLLING ASTRONOMER, is open to all interested persons. There are no other requirements. In fact we heartily welcome new members; and each present member can do the Association a very real service by getting us at least one new member during the coming year. How about it? After all, the services which we can offer our members depend in part merely on how many members we have. We simply could not have published the periodical as it now is in 1947, and we hope that by 1959 we shall be issuing a much improved STROLLING ASTRONOMER to a much enlarged A.L.P.O. If not, we shall not have progressed; we shall have gone backwards.

All activities in the A.L.P.O. are on a voluntary basis. Each member is free to participate just as much or as little as he wishes in our various activities. We prefer, of course, that everyone should do as much as he can; but there is no compulsion. We have operated in a completely informal way; our staff members have contributed generously of their time to make the A.L.P.O. a success.

We are indebted to many people for important help in the last six years. First of all, we should mention our Secretary and the other staff members, past and present. Next, we must surely thank the Stevens Agency, our publishers since the summer of 1949; indeed, Mr. Stevens argued at much length to persuade the Editor to adopt certain of our policies which later proved highly successful. We must also thank our many regular observers over the entire world for their splendid contributions. We are obliged to the many authors of papers carried in THE STROLLING ASTRONOMER. We have enjoyed a heavy correspondence with amateur astronomers in every walk of life, all united by a common love of astronomy. Finally we must thank many others, far too numerous to be mentioned individually who have assisted in one way or another.

Though we may take some pride in what we have accomplished, we must also be very aware that far more can and should be done. We must not forget that our goal is to stimulate, coordinate, and generally improve lunar and planetary astronomy. Almost all the observing the A.L.P.O. carries out is done by less than 10 percent of its members. Surely there are many more of us who can do regular lunar and planetary work, even if some others cannot.

Again, we exchange THE STROLLING ASTRONOMER with a number of other astronomical periodicals, some in foreign languages; and in these there are articles of definite importance to lunar and planetary students from time to time. We would like to know how to make these articles available to interested A.L.P.O. members, widely scattered as they are. Does anyone have any ideas? Also, there are planetary events, like new spots on Saturn and projecting clouds on Mars, where it is of the greatest importance to alert as many observers as possible in 24 hours or less, including ones scattered in longitude around the globe. We know of no simple and reasonably inexpensive way of doing so and shall thus continue to fail to secure important observations. Can something be done? We should also consider how we may best cooperate with the Astronomical League (perhaps by applying for membership) and with various societies on this continent and abroad. We still need qualified people to serve as Section Recorders and also on certain special projects, such as the study of the lunar bright rays proposed by G. D. Roth. Finally, we would like to voice a hope for the future - that some day we shall have A.L.P.O. Conventions and shall get to know each other better.

VENUS AFTER INFERIOR CONJUNCTION 1951 THROUGH 1952 TO THE PRESENT TIME.

by James C. Bartlett, Jr.

A gratifying number of observations have been reported by the following A.L.P.O. members: R. M. Baum (3-in. refr.); Lee Bellot (8-in. refl.); Clive Chapman (8-in. refl.); Phil Cluff (6-in. refl.); T. Cragg (6-in. and 12-in. refls.); Eugene Epstein (6-in. refl.); T. E. Howe (4-in. refl.); H. Le Vaux (10-in. refl.); A.P. Lenham (3.25-in. refr); P. A. Moore (3-in. refr.); C.C. Post (6-in. refl.); O.C. Ranck (4-inch. refr.); T. Saheki (8-in. refl.); H. P. Squyres (6-in. refl.); and S. C. Venter (2.75-in. refr. and 12-in. refl.). It may be noticed that reports have come in from as far afield as England Australia, South Africa, and Japan.

Venus passed inferior conjunction at 15^h, September 3, 1951 by U.T. and date; and our assiduous observers lost no time in picking up the morning crescent. Indeed, C. C. Post observed the planet at $15^h 21^m$ (U.T. here and later) On Sept. 3. He was followed by P. A. Moore (September 16); T. Cragg (September 20); Lee Bellot (September 24); T. Saheki (September 27); and O. C. Ranck (Oct. 18). C. B. Stephenson's observations, September 3, 1951, from $16^h 15^m$ to $18^h 15^m$, have already been discussed.[1]

THE ILLUMINATED ATMOSPHERE. C. C. Post made a number of valuable observations of this beautiful phenomenon. On August 31, 1951, just prior to inferior conjunction, he at one time found "the bright ring to extend entirely around the ball"; but apparently he did not see the continuous ring in one view, rather by "flashes" here and there along the limbs which showed it to be continuously present. He notes that on September 1, 1951, he found a Wratten blue filter to be best in showing the extension of the circle of illumination. On September 2, 1951, he saw the complete, unbroken circle of light around the circumference of the dark planet, noting that the ring of light was "very thin and faint". A curious appearance on this date was an apparent "lengthening along the East-West axis" which made the planet appear not quite perfectly spherical; undoubtedly an effect of the atmospheric illumination. Post also noted difference in intensity of the ring of light, here and there, very probably owing to local differences in refractive power of the Venusian atmosphere, already generally illuminated by reflection and diffusion to make the ring visible. Such differences should, in fact be expected, since the refractive power of an atmosphere will be different in different parts depending upon local concentration of vapor, dust, or haze and being locally affected by changes in density and temperature. Post made his last observation of the illuminated atmosphere on September 23, 1951, when once again he saw a complete ring of light around the planet "by flashes". He remarks that he was "most surprised" to see the phenomenon when so far from inferior conjunction and questions its nature.

It may be remarked in this connection that abnormal illuminations of the Venusian atmosphere, not easily ascribable to refraction or reflection effects, have been recorded by many observers, including the best. Explanations have varied all the way from the fantastic theory of Gruithuisen that at stated intervals the Venusians set fire to their forests, in celebration of religious rites, to the scarcely less fantastic theory that the surface of the planet is covered with fluorescent sulphides. It seems a little more probable that solar effects, e.g. aurorae, much more intense for Venus than for the earth, may be suspected.

THE DARK SIDE. R. M. Baum has rendered a tremendous service by copying an obscure and important paper on this subject by Professor A. Schafarik of Prague, published in the Report of the Forty-Third Meeting of the B.A.A.S., September, 1873. In this paper, Professor Schafarik lists the number of its appearances as known to him, and traces it back to an English observation made some time before 1729. For all that is known to the contrary it may have been seen much earlier. At least the visibility of the dark side has a respectable ancestry of ancient vintage.

C. C. Post regularly saw the dark hemisphere during his observations of the illuminated atmosphere cited above. In all cases it was darker than the sky. However, observations taken at and so close to inferior conjunction are less evidential than those made from elongation to conjunction, and vice versa. The reason is that if one sees the atmosphere illuminated as a delicate ring of light, the eye will almost certainly provide a dark body around which this ring will run. However, on September 2, 1951, Post saw a brighter lune within the dark area (Haas' phenomenon) and a "Hazy area" on the dark side near the east limb somewhat like a spot. This recalls Cragg's remarkable observation of the continued visibility of a belt-like marking on the dark side.[2]

Haas' phenomenon was also reported by Lee Bellot and Phil Cluff, both of whom repeatedly observed a brighter lune in the dark side of the morning crescent. Cluff first recorded this appearance at $13^h 15^m$, October 7, 1951 with his 6-in. refl. at 120X and a green filter (Fig. 1). He saw it subsequently on October 26 and 28, the shape and area not always being the same. (Fig. 2).

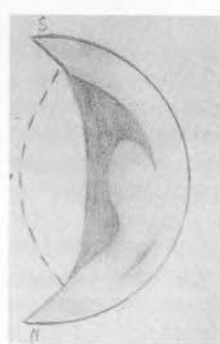

Fig. 1. Venus, 10/7/51. $13^h 11^m$, U.T. S-3; T-5. 6" refl. at 120X. Dashed line indicates boundary of bright lune on dark side. Phil Cluff

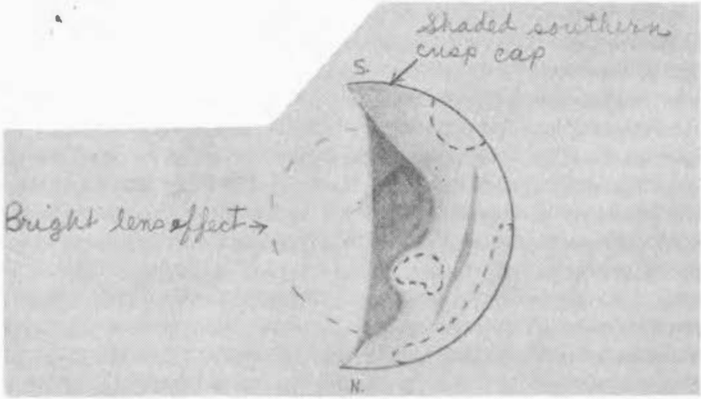

Fig. 2. Venus. 10/26/51, 15^h 10^m, U.T. S-3; T-4. 6" refl. 120X Dashed line indicates boundary of bright lune on the dark side. Phil Cluff.

Bellot, 8-in. refl. at 115X, first saw it on October 4, 1951, at 13^h35^m; and thereafter on the 6th, 7th, and 11th.; and last on November 25, 1951, eleven days after greatest elongation west. Two observations on October 6, 1951, by Bellot, The first at 14^h 25^m and the second at 15^h 50^m, show a considerable apparent decrease in area between the two times (Figs. 3 and 4). The sky grew much brighter between these two observations, perhaps contributing to the effect of decreasing size.

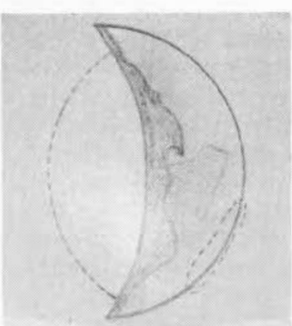

Fig. 3. 10/6/51. 14^h 25^m, U.T. S-4; T-3. 8" refl. at 115X. Dashed line indicates boundary of bright lune on dark side. Lee Bellot

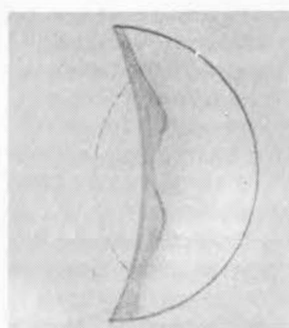

Fig. 4. 10/6/51. 15^h 50^m, U.T. S-3; T-4. 8" refl. at 115X. Dashed line indicates boundary of bright lune on dark side. Lee Bellot

These curious appearances would appear to be confirmed by R. M. Baum, who reports that on September 11, 1951, at 5^h 45^m, "a light central patch in the dark hemisphere was observed." The only other report at hand of the visibility of the dark side is a recent one by O. C. Ranck who on December 7, 1952, at 21^h 40^m, saw the dark hemisphere silhouetted against the twilight sky. It was darker than the sky and was observed with two powers on his 4-in. refractor, 180X and 60X. The appearance was confirmed by Mr. Ranck's assistant, Miss Betsy Beckley.

THE BRIGHT SPOTS. These were abundantly observed almost from inferior conjunction to superior conjunction. They varied in intensity and took the usual form of vague areas of greater-than-average brightness, occurring in all parts of the disc. Cluff, Bellot, Ranck, Moore, Lenham, Saheki, and Le Vaux all recorded them. There is nothing significant in their distribution and they are almost certainly to be refferred to clouds. Both Bellot and Cluff record apparent humps on the bright limb.

Special mention must here be made of a valuable technique used by Howard Le Vaux. He uses red and amber filters to explore the markings, finding both the bright and dark spots to vary in intensity with the filter used. The Recorder cannot too highly recommend this practice, particularly as with a sufficient assortment of filters much may be learned of the probable color present.

THE DUSKY SPOTS. These appear to have been fairly accessible to all of the observers, and were seen very early after inferior conjunction. Cragg shows a dusky spot just north of the apparent equator, merging with the terminator, on the very thin morning crescent of September 20, 1951. Three such spots are recorded for September 21. Moore shows a dusky spot perhaps identical with one of Cragg's, on October 12, 1951. The appearance of these spots necessarily so close to the limb is a little unusual, and it may be that they are to be referred to contrast effects.

Agreement among the various observers is very good, not in specific detail (which is hardly to be expected), but in the nature of the spots most of which were large, dusky, oval to irregular areas. The question of the reality of such spots has been considered in an earlier paper;[3] but sufficient to say that on going over drawings made in the last century it is not uncommon to find scattered examples which so closely resemble modern figures that identity is hard to doubt. The Recorder would consider that the drawing by O. C. Ranck, November 12, 1952 (Fig. 5), represents the same markings recorded by H. P. Squyres, November 20, 1952 (Fig. 6). There are specific differences, but the family resemblance, so to speak, is unmistakably strong.

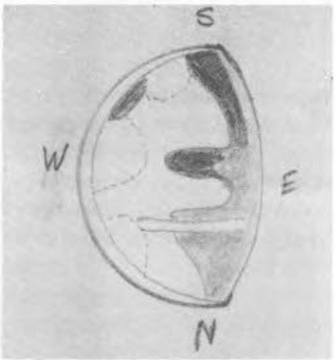

Fig. 5. Venus. 11/12/52. 19^h 40^m, UT S-5; T-4. 4" o.g. at 180X. O.C. Ranck

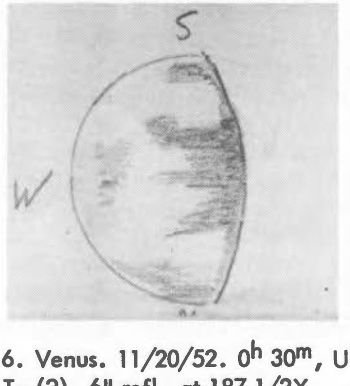

Fig. 6. Venus. 11/20/52. 0^h 30^m, UT. S-2; T- (?). 6" refl. at 187 1/2X. H. P. Squyres.

Most of the observers depicted the spots as maria-like in character; but O. C. Ranck, who began his 1952 observations as early as last August 23, shows many examples of streak-markings some of which strongly resemble Lowell's drawings and the more recent figures of R. M. Baum.

However streaks were also recorded, at various times, during the latter half of the 1951 morning apparition by Bellot and Cluff. They have also been observed during the current evening apparition; by H. P. Squyres, November 21 and 24, 1952; and less perfectly - more like belts - by T. Cragg, September 3-4, 1952. One of Squyres' drawings is almost certainly a figure of the same streak system observed by the Recorder in February, 1951. The Recorder's personal records contain several instances of what appear to be returns of the same streak system, which would indicate stability at least for some of these linear markings-a view also held by R. M. Baum.

Moore, however, saw only vague, shadowy maria-like markings during the 1951-1952 morning apparition and remarks that "The sharp, Lowell-like bans of Baum and others elude me completely."

THE CUSP CAPS. While most often bright, a surprising number of observations were made of dusky caps. Insufficient data do not permit of determining which cusp appeared the brighter on the average; but P. A. Moore's truly beautiful drawings show the south cusp cap the larger of the two from November 26 to December 12, 1951. Moore also writes that "Throughout December a whitish patch persisted in the south, while a smaller white area was often seen in the north..."

On September 7, 1952, at $22^h 45^m$, O. C. Ranck found a very prominent and bright S. Cap, which he remarks was similar to the Martian polar cap in appearance; but on October 23, 1952, $22^h 50^m$, Ranck found the S. cap to be dusky. There is thus some evidence for rather marked variations in the brightness of the cusp caps from inferior conjunction, 1951, to the 1952 evening apparition. On balance the S. cusp cap appears to have been the brighter and larger of the two, which is its normal relation to the N. cap.

Cragg is strongly of the opinion that the Venusian cusp caps mark the poles of rotation, a view which the Recorder as strongly endorses. If this be so, there is no physical reason why the Venusian poles should not be covered with snow and ice-granting the necessary aqueous element-despite the proximity of Venus to the sun; and if it be true that the bright cusp caps of Venus represent true polar caps, then we find a very remarkable coincidence; namely that on three of the terrestrial planets, Venus, Earth, and Mars, the south polar cap is the larger of the two. In the case of Earth and Mars the reason is obvious: For each planet the southern hemisphere goes through its winter season when the planet is farthest from the sun, which means a shorter summer and a longer winter than for the northern hemisphere.

TERMINATOR. Moore remarks that cusp deformations, September 1951 to February 1952, were "unusual"; and both Cluff and Bellot show occasional irregularities, chiefly at the N. cusp, through the morning apparition of 1951. However, no marked irregularities of the terminator other than at the cusps, appear to have been observed.

The time of apparent dichotomy, in the morning apparition of 1951, seems to have lagged well behind the date of theoretical dichotomy, November 14, 1951, as given in the American Ephemeris and Nautical Almanac. S. C. Venter continued to see the cusps protruding, sometimes one, sometimes both, until Nov. 23, and did not record a straight terminator until November 26. Moore surpasses even this late estimate, and remarks that "Dichotomy was roughly estimated as December 5, with an uncertainty of some days either way". Epstein, however, fancied the reverse and found the terminator "definitely convex" as early as November 14, the date of theoretical dichotomy! Such irreconcilable differences between estimates of apparent dichotomy are well known and have long presented us with a mystery; for which there has been no satisfactory explanation beyond the rather vague textbook statement that they are due to effects of the Venusian atmosphere. The possible mechanism will be discussed in a future paper. Insufficient data preclude any estimate of mean dichotomy, as observed in the 1951 morning apparition.

Acknowledgement must here be made of the recent, remarkable observations of R. M. Baum, which were communicated to the writer in the spring of '52. These careful and well-detailed observations deserve a more extended treatment than is possible here, and will form the subject of a separate paper to be prepared in the near future.

REFERENCES

1. Venus to and beyond Inferior Conjunction in 1951; The Strolling Astronomer; vol. 5, No. 12; p. 8 et seq.
2. Ibid; p. 11.
3. The Markings of Venus-Some A.L.P.O. Studies; The Strolling Astronomer; Vol. 6, No. 2; p. 17.

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BOOK REVIEW

by Walter H. Haas

The Universe We Live In. By John Robinson. 252 pages. $4.50 Thomas Y. Crowell Company, New York. 1952.

This book is a popular, descriptive presentation of astronomy and some facets of geology. It is addressed to the amateur scientist and certainly can provide him with some enjoyable reading. The book avoids mathematics and is very easy to read. The text is adequately illustrated with some dozens of photographs, including many of the standard astronomical ones. It is quite different in its general approach from the ordinary astronomy text, and if read as a very first book on the subject, should doubtless be supplemented by such a text. The author largely presents the conclusions of science without saying much of the underlying reasons that have led to them, perhaps because of space considerations; for example, on pp. 67-68 the past and future changes in the distance of the moon from the earth are stated without any mention that they depend upon the tides. The book gives curiously little information about the author, who is apparently a British astronomer.

After an Introduction by the Astronomer Royal, Chapter I, called "Time", is on a philosophical tone and besides giving the usual information about local times, longitude, and the date line, speaks of J. W. Dunne's philosophy of Serialism. Chapters II and III contain a very fair amount of information about the stellar universe. There follow short chapters on spectrum analysis, gravitation, and eclipses. Chapters VII, VIII, and IX deal with the Solar System. Those with a flair for figures may like to manipulate the formula on pg. 83 for the interval between close approaches of stars to each other. The planets are discussed as regards their possible habitability. Mr. Robinson here properly stresses that we should be wary of making dogmatic statements about physical conditions on Jupiter and Venus from observations necessarily limited to the (atmospheric) reflecting surfaces of those planets. As regards lunar conditions the author follows Newcomb's famous terse statement, which he quotes; we fear that this section may be better as literature than as science. Chapter X considers "How the Earth Might End", and Chapter XI on "Exploding Atoms" deals with radio activity. There follows a rather long chapter about volcanoes, including their long-term economic effects. Chapters XIII and XIV deal with geology. Much space is given to the Wegener Continental Drift Hypothesis and to evidence supporting it.

The text appears to be reliable enough, though there are a few statement which one might challenge. It is hardly proved, for example, that "solar systems like ours are exceedingly rare and exceptional in the Universe" (pg. 102). It simply isn't true that "the height of the lunar mountains "...has been measured to within a few feet (pg. 119)"! Uncertainties in the measures are far more than that. Opposite pg. 118 a photograph of Jupiter has been reproduced upside down, south being at the bottom.

These, however, are minor blemishes. We are sure that most of our members would find the book enjoyable to read and informative.

Note. Readers may buy The Universe We Live In from the Editor at 1203 N. Alameda, Las Cruces, N. Mex. You will be aiding the A.L.P.O. by ordering from the Editor.

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HAZE

by H. Percy Wilkins

The drawing (Figure 7) was made with the aid of the 25-inch refractor at Cambridge University Observatory, England on 1952, Oct. 4, 21^h to $21^h\ 20^m$, U.T., under good conditions of seeing. The 25-inch refractor was made by T. Cooke, the celebrated English optician, in 1868, for a Mr. Newall, who later presented it to Cambridge. It was then the largest refractor in the world and the objective is very good, although, perhaps, not quite so nearly perfect as the Meudon 33-inch.

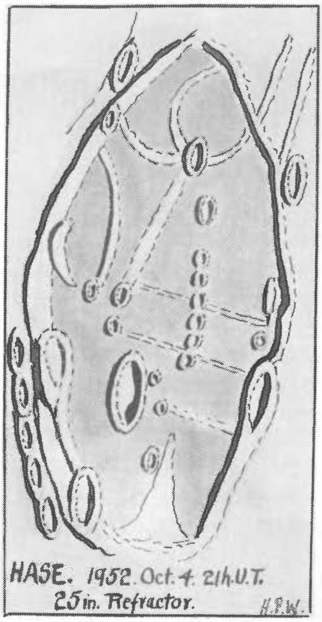

Fig. 7. Drawing of Lunar Crater Hase by H. P. Wilkins. Colong. = 103.°0.

The following details were clearly seen:

On the interior of Haze there is a large crater on the northern portion, immediately to the east of which are two minute craterlets. West of this crater is a high mountain on the inner slope of the wall. A small crater lies northeast, close to a whitish projection from the north wall. To the southwest are three small craters and the remains of an ancient ring, as well as a long, low, white ridge. Southeast of the large crater is a chain of six craterlets, to the south of which are two craters and low ridges which seem to be portions of the walls of old and now largely buried rings. There is also a craterlet close to the east wall and south of it a hill or landslide. On the inner west slope there is a craterlet on the south and a large but shallow crater on the north. A coarse crater-chain was noted on the outer northwest wall. Three low ridges, little more than light-streaks, cross the eastern portion of the interior.

The moon was full on Oct. 3, 1952 so that Haze was observed under evening illumination.

FOOTNOTE BY EDITOR. Crater Haze is on Section X of the Wilkins map. References to Haze may be found in The Strolling Astronomer, Volume 6, pp. 27-28, 71, 104, 137 (Figure 3), and 147-148. It should be interesting to compare Mr. Wilkins' drawing to what was seen with smaller telescopes.

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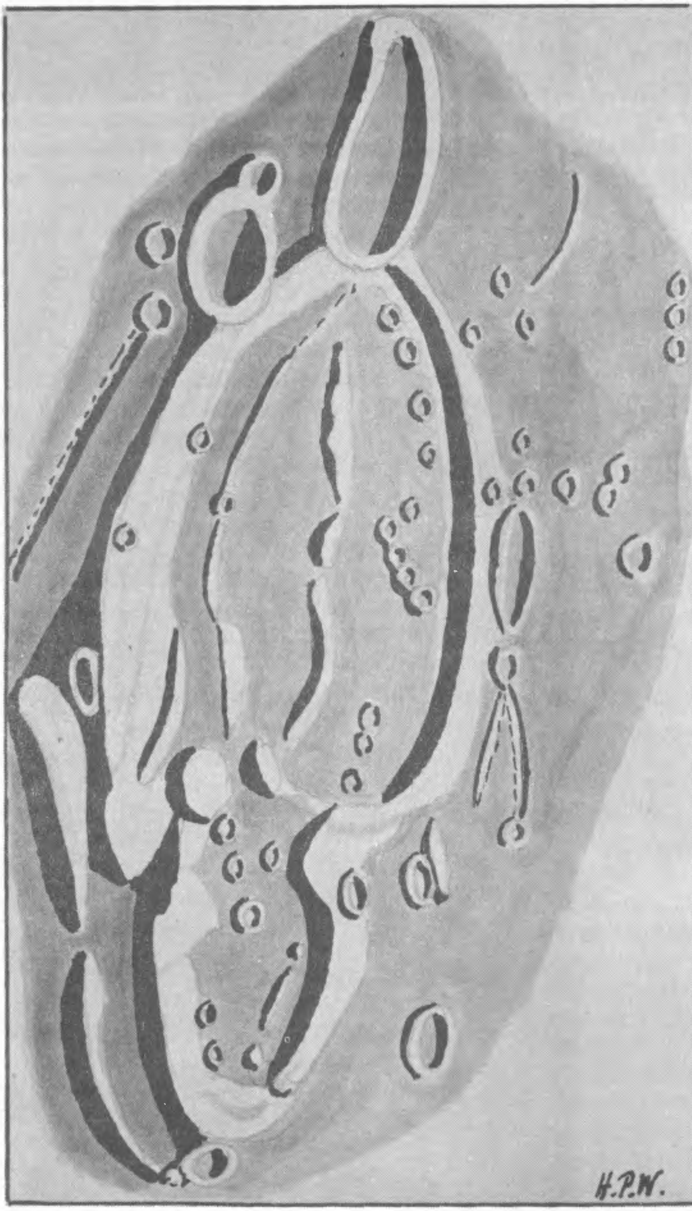

Figure 8. Legendre. Cambridge 25-inch refr. Oct. 4, 1952. $21^h\ 30^m$, U.T. H. P. Wilkins. Colong. = 103.°2.

LEGENDRE

by H. Percy Wilkins

This formation, which lies to the west of Petavius [on Section X of the Wilkins map] , was observed with the 25-inch "Newall" refractor at Cambridge University Observatory, England, on 1952, Oct. 4, $21^h\ 30^m$, U.T., under good conditions. The drawing made is reproduced as Fig. 8.

The large craters, one double, on the south, with the two small craters from one of which a distinct cleft runs northward, were very prominent. The north wall is broken by a pass which communicates with a smaller formation. On the floor of this smaller object six craterlets, two hills, and a short ridge were seen. On the interior of Legendre itself is a small central hill, the highest portion of a longitudinal ridge. To the west is a lower ridge, on which is a craterlet, one of fifteen craterlets on the interior; four in a chain on the east. On the outer east glacis is a crater, with a craterlet to its north from which issues a short, bent cleft. South of the crater are several craterlets.

Many of the craterlets, together with the two clefts, have not been previously recorded. Telescopes of considerable aperture will be required to confirm these features.

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OBSERVATIONS AND COMMENTS

Aristarchus, the brightest crater on the moon, has been observed recently by A.L.P.O. members J. T. Carle (8-inch refl.), R. M. Adams (3-1/4-inch refr.), and A. P. Lenham (2-1/2-inch refr. and 3-1/4-inch refr.). In describing their observations it will be convenient to speak of colongitude, which is a measure of the solar illumination of a lunar region. The sun's selenographic colongitude is defined as the lunar eastern longitude of the sunrise terminator, measured along the moon's equator from the center of the disc at mean libration to the sunrise terminator. Colongitude is an approximate, but not an exact measure of phase, being near 0° at first quarter, near 90° at full moon, near 180° at last quarter, and near 270° at new moon. The three observers of Aristarchus mentioned above drew the dark bands on the inner walls, and Figure 9 is representative of Mr. Lenham's views. The two most prominent bands on the east inner wall were seen by all three observers, who differ considerably in how wide they draw the dark bands. It should be borne in mind that the effect of irradiation is to make darker bands on a brighter background look too narrow. Mr. Carle on October 3, 1952 at colongitude 83.$^{\circ}$4 was surprised to find that two dark bands on the southeast inner wall crossed the rim and extended toward Herodotus, one of them being parallelled by a couple bright bands. Mr. Lenham on September 5, 1952 at colongitude 109.$^{\circ}$8 resolved one of these bright bands into small and separated bright spots and streaks. These features between

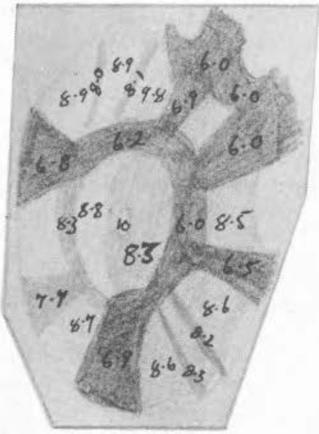

Fig. 9. Aristarchus. A. P. Lenham. 3-1/4-inch refr. 166X. March 12, 1952. 20^{h} 30^{m}, U.T. Colongitude = 107.$^{\circ}$7.

Aristarchus and Herodotus are, however, nothing new, having been drawn often in the past. In the view just mentioned Carle remarked two small craters on the southeast rim of Aristarchus, objects previously recorded by H. P. Wilkins and E. J. Reese. The northern of the two main dark bands on the east inner wall has often been drawn by Reese to be y-shaped or forked and to terminate well below the rim of Aristarchis; it is so shown, for example, on Figure 4 on pg. 1 of the March, 1951 Strolling Astronomer. Carle saw it forked-shaped on October 3, 1952, as Lenham did less clearly on March 14, 1952 at colongitude 132.$^{\circ}$2; but both observers drew the band to reach the rim. Adams on October 1 and 2, 1952 at 57.$^{\circ}$3 and 69.$^{\circ}$7 respectively drew this band to reach the rim but did not show it forked. It would be worthwhile for other observers to examine its aspect. It will be noted on Figure 9 that Lenham uses numbers to denote the intensity, or brightness, of lunar features. These are on the Standard Lunar Scale of zero (black shadows) to ten (most brilliant marks). It is very interesting to use such intensity-numbers to study how different lunar features change in brightness each lunar day, though it must be admitted that the lack of satisfactory comparison-areas of known and constant intensity is a severe handicap. Even so, an observer can with practice learn to use such a scale rather well, although large systematic differences are still likely to exist between different observers. We recommend that lunar and planetary observers use such scales more; they are certainly preferable, with all their shortcomings, to the much too common practice of drawing merely dark features on a bright background - as though there were only two grades of intensity! Two of Lenham's drawings are under similar solar lighting and may hence be compared to each other; the one is on March 12, 1952 at 107.°7 with a 3-1/4-inch refractor (Figure 9), and the other is on September 5, 1952 at 109.°7 with a 2-1/2-inch refractor. Allowing for the lesser amount of detail shown by the smaller telescope, the chief differences are that the notable dark band on the north inner wall called 6.9 in intensity on Fig. 9 was apparently invisible on September 5 and that the notable dark band on the south inner wall called 6.9 in intensity on Fig. 9 was much lighter, 8.2 in intensity, on September 5.

J. T. Carle on October 28, 1952 near colongitude 27° observed the central craterlet in Plato as a craterlet partially filled with shadow, using an 8-inch reflector. This observation is very praiseworthy for the aperture and certainly demonstrates very good optics. Curiously, Carle saw no other detail in Plato, even though past views under similar lighting not of good enough quality to show the central craterlet as a rimmed, shadow-holding feature have many times shown several other craterlets (as bright spots) on the floor.

Observing with his 3-1/4-inch refractor at 166X, A. P. Lenham on October 7, 1952 drew the lunar crater Moore at 140.°1 and the lunar crater Eratosthenes at 140.°2 Moore, formerly Hippalus A, is on Section VII of the Wilkins map of the moon and is named for Mr. Patrick A. Moore, one of our active members and valued colleagues in England. The solar lighting being near noon on crater Moore, Lenham drew two dark bands, the one running east-west and dividing the crater into roughly equal north and south parts and the second joining the middle of the west wall to the southeast wall. The western half of Moore was more dusky in tone than the eastern half.

Lenham and others in the B.A.A. Lunar Section have been very interested in recent years in banded lunar craters like Moore and have even suspected that these dark bands may vary in ease of visibility independently of the solar lighting. Erasosthenes is very easily recognized as a ring-plain, 38 miles across, at the southeast end of the lunar Apennines. Under high lighting its floor and walls are covered by a complex pattern of dark areas, of which W. H. Pickering made a long study. Lenham is now investigating the intensity-changes of the major dark areas.

R. M. Adams has contributed drawings of the lunar crater Almanon on September 26, 1952 at colongitude 355.°7, using a 3-1/4-inch refractor at 160X, and of the lunar crater Descartes on October 25, 1952 at 349.°4, using the 12-inch refractor at the Morrison Observatory of the University of Missouri at 204X. Both Almanon and Descartes may be found near the lower right corner of Section IX of the Wilkins map. In Almanon Mr. Adams drew several craters on the floor and several others a little outside the rim; almost all of them can be quickly identified on the Wilkins map. The drawing of Descartes shows one fair-sized crater near the southeast edge of the floor and a number of small irregularities on the floor. Adams writes that he has followed with keen interest discussions in The Strolling Astronomer about the relative performance of large and small telescopes and that one of the objectives of his visit to the Morrison Observatory was to try out in person a comparatively large aperture. He gives his opinion that there must sometimes be too much glare for best results with a large telescope; for example, he sometimes can distinguish small differences in tone with his 3-1/4-inch refractor at 160X which are not visible in his 10-inch reflector at 288X. It is true that the 10-inch usually shows more. Adams thinks that delicate details will be blurred out when the image is too bright, and here we must surely agree with him. The Editor would urge, however, that the best solution is not to reduce the aperture and hence to throw away potential resolving power;; rather he would advise dimming the image by the use of a higher magnification or a filter.

On October 4 and 5, 1952 H. P. Wilkins and P. A. Moore were able to observe the moon with the 25-inch Newall refractor and the 30-inch Steavenson reflector of the University of Cambridge in England. The results on Haze and Legendre appear elsewhere in this issue. Other formations observed at Cambridge are the region west of Vendelinus, the central mountains of Petavius, Endymion, the "Trapezium" in Mare Crisium, Proclus, Messier and Pickering, Condorcet, and Palitzch. Moore writes that he found Palitzch to be "a perfectly well-defined crater-chain, and not a 'gorge-like valley' at all." We hope to say more of these Cambridge observations in future issues. It is certainly most gratifying that Wilkins and Moore are occasionally permitted to use the large telescopes at Cambridge and Meudon for visual studies. Is it too much to hope that American observatories may occasionally grant similar privileges to advanced amateurs?

P. A. Moore observed the small ring-plain Lichtenberg, lying near the northeast limb on Section XVIII of the Wilkins map, on September 2, 1952 at colongitude 73.°9. He employed a 12.5-inch reflector at 325X. Moore could see no trace of the color sometimes observed near Lichtenberg in 1940-52 by Barcroft, Baum, and Haas. The crater had a gray floor and white walls, with a peak on its east wall. It abutted on a smaller plain of similar type to its northeast, and three hills still farther east appeared to lie on a gently sloping dome.

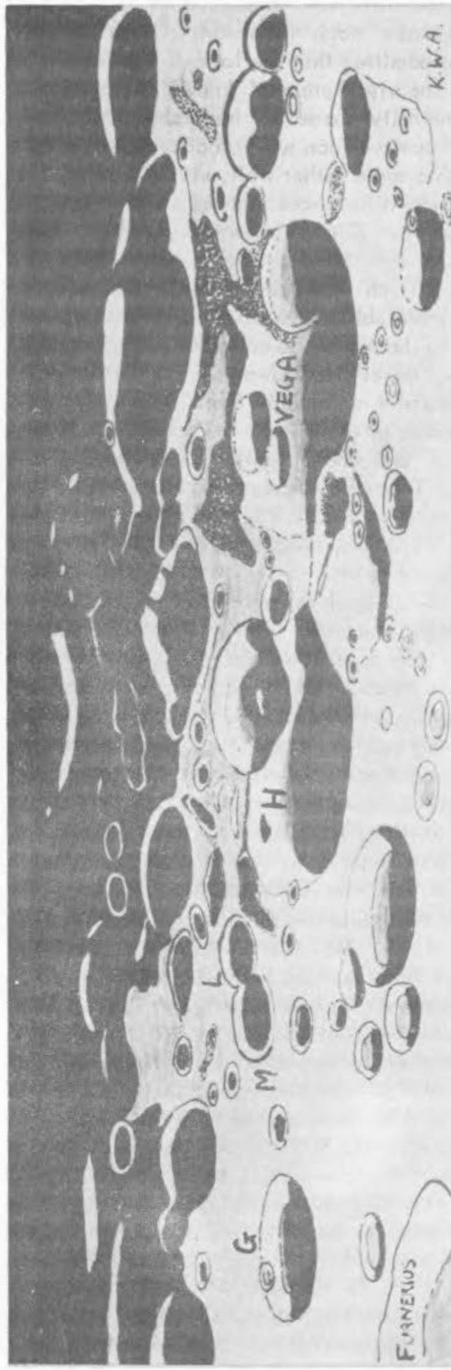

Figure 10. Vega and Vicinity. K. W. Abineri. September 5, 1952. $23^h 45^m$, U.T. 8-inch refl. 232X. Colongitude = 110.°6.

Figure 10 is a sample of K. W. Abineri's careful and detailed drawings of the lunar limb regions. The area shown is on the southwest limb; Furnerius, appearing at the lower left corner, is the southernmost of a chain of four giant walled plains. (The others are Langrenus, Vendelinus, and Petavius.) This area is on Section XXV of the Wilkins map, and lunar students will find it instructive to compare Figure 10 to the Wilkins map. The orientation of Figure 10 is not the customary astronomical one; the vertical direction is normal to the lunar limb (here the southwest limb). The mapping of the limb regions on the moon is still incomplete enough that an amateur can here make a definite contribution. A large telescope is not necessary; but patience and persistence are; and naturally one may have to wait a long time for the best combination of libration and solar lighting. Our British colleagues have shown the way, and their example is worthy of imitation.

D. P. Barcroft offers some comments on G. D. Roth's article on the lunar rays in our December, 1952 issue. Our Secretary, we should say, has devoted a great amount of time to lunar observing during the last 15 years or so and has an extensive private library of old lunar work. Mr. Barcroft thinks that Mr. Roth's division of the rays into those of the Tycho type and those of the Copernicus type is too simple. He continues and mentions some curious personal observations he has made of the rays, ones which he cannot recall having ever seen published. First, a fan-shaped ray of Proclus bends around the crater Pierce in Mare Crisium, apparently avoiding Peirce for some reason. Second, the ray through Bessel appears to change its position with respect to Bessel each lunation. Dennett observed the same effect many years ago and reported it in the old English Mechanic; it is surely optical. Third, Barcroft has noticed an offset in the course of several rays where they cross a crater. In other words, the path of the ray on one side of the crater is somewhat out of line with the path on the other side. A good example is the ray through Rosse in the Mare Nectaris. It would be worthwhile for A.L.P.O. members to look for examples of such offsetting, both at the eyepiece and on photographs of the moon. Such offsetting may well bear on the relative age of lunar formations since the crater involved is presumably younger than the ray its formation apparently distorted.

Most amateurs find their planetary studies all too often plagued by bad seeing, that is, by unsteady air. This bad seeing, has absolutely nothing to do with the clearness of the sky; it is the same effect that one sees through the heated air above a bonfire. With a kind of civic pride in reverse many observing planetarians and lunarians appear convinced that the seeing at their particular site is the world's worst. Although most of us find our choice of a place to live dictated by personal and economic considerations rather than by astronomical advantages, it is still of interest to learn of seeing conditions in different parts of the world. A letter from F. M. Bateson in Rarotonga, Cook Islands, South Pacific, dated Stepember 21, 1952, gives a short description of seeing there. Mr. Bateson is a very well-qualified judge, for he is the Director of both the Variable Star Section and the Jupiter Section of the Royal New Zealand Astronomical Society. He reports that the seeing on Rarotonga averages six, on a scale of 0 to 10 probably nearer seven for the morning hours. That is very good indeed; for Mr. Clyde W. Tombaugh has given as his estimate in conversation that the average seeing at Flagstaff is only five and one-half. The island of Rarotonga is just within the tropics; it has a total circumference of 21 miles, and hills rise steeply inland to a maximum elevation of about 2,000 feet. When the moist trade winds blow, clouds tend to form across the peaks only. Towards midnight the wind reverses direction and blows softly from the land until dawn, the morning hours usually offering clear skies and very steady seeing.

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THE LIMITS OF TELESCOPIC RESOLUTION: A SYMPOSIUM.

The Problem. For the advanced visual student of the moon and the planets it becomes very important to know not only what his telescope will show; it becomes equally important to know what it will not show. In other words, he wishes to know his exact instrumental limitations, preferably as a mathematical function of aperture. How narrow a dark line will a given aperture reveal on a planetary surface? How small a dark dot? How small a bright dot? How close together can it resolve two lines from each other? Two dots? It must be admitted that we possess only rather rough knowledge of the answers to such questions. It is certainly true that some observers, such as our own J. C. Bartlett and A. P. Lenham, have reported a surprising amount of detail with very small telescopes; and we must certainly bear in mind the great importance of the training of the eye, as discussed by Dr. Bartlett in our February, 1953 issue. Others have been skeptical of such reports, perhaps chiefly those who do not see the same features with larger telescopes. However, the whole matter rests all too heavily on personal opinions. Some have sought, like D. W. Rosebrugh, to gain information through experiments with detail of known size on artificial discs. Others, like G. D. Roth and M.B.B. Heath, do not think that the results of such experiments can be permissibly extrapolated to the actual planetary images in our actual telescopes. Certainly the experiments will never simulate reality perfectly.

Background of This Article. In August, 1949 several A.L.P.O. members made independent drawings of Ganymede, Jupiter's third satellite, with the Griffith Observatory 12-inch Zeiss refractor. These were published in a short article in Sky and Telescope for January, 1950, pg. 59. Mr. John Mellish, the famous telescope-maker at Escondido, Calif., discussed these drawings in correspondence with Mr. Thomas R. Cave. Mr. Mellish asserted that the markings on Ganymede (Jupiter III) on these drawings are shown much too small and that it is impossible for the observable breadth or diameter of a planetary feature to be less than the Dawes Limit of the aperture. This correspondence came to the attention of the Editor. Since the problem raised is of great importance in visual planetary astronomy, the Editor decided to circulate this correspondence among about 20 of the more active A.L.P.O. members and to invite their comments on the problem. The circulating took fully two years - the method is hardly practical! A number of persons have expressed the wish that this material on limits of telescopic performances, material on limits of telescopic performances, material which grew in bulk as it pass ed from hand to hand, should be at least partly published in The Strolling Astronomer. In this article, which will be continued in future issues, the Editor has tried to gratify this wish.

It has, of course, been necessary to condense the comments of the different contributors. The Editor has attempted to preserve the salient points of each colleague's argument, whether or not he agrees with them. Since the material was only circulated once, Mr. Mellish has had no opportunity to reply to his critics; and the earlier commentators have had no opportunity to try to answer the later ones. Certain parts of the circulated material not bearing on the problem under discussion are not considered here.

John Mellish Expresses Some Opinions on Telescopic Limits. In letters to Mr. T. R. Cave on January 21, 1950 and March 3, 1950, Mr. Mellish points out that a 12-inch telescope has a Dawes Limit of 0.38". When the drawings were made, Ganymede had an angular diameter of 1.6". Now although markings having dimensions below the Dawes Limit can be seen, Mellish stresses that they cannot be seen in their true aspect; in the telescopic image no marking can be smaller than the Dawes Limit. In a debate with Ellison in The English Mechanic in 1908-9 Mellish recalls that he demonstrated that a kite string 1/16 of an inch in diameter has the same apparent diameter to the eye at a distance of 50 feet as at a distance of 1300 feet. The true diameter of the kite string is not seen at either distance, being below the limit of resolution of the eye. Applying this criterion to the drawings of Ganymede, every marking present must have had fully one-fourth the diameter of the satellite (1.6"÷0.38"). Actually, the markings shown are all drawn smaller than that, a few of them even having less than 1/15 the diameter of Ganymede. Mr. Mellish feels that such errors in drawing on the part of planetary observers are most unfortunate and tend to discredit their work.

He remarks that diffraction also explains the "black drop" effect when Mercury is near ingress or egress during a transit of the sun. The explanation, Mr. Mellish says, is simply that one canaot see a thread of light between the disc of Mercury and the limb of the sun if it is more narrow than the Dawes Limit of the aperture used. He saw this effect very well at a transit in 1907.

David P. Barcroft Endorses Them. Our Secretary says that he is glad to follow Mellish.

Donald O'Toole is Perplexed. This observer had long suspected that he sometimes drew planetary features too thin, but Mellish's idea on their true size was new to him. He then remarks: "There is still some difficulty to be overcome, however, since on very small discs we see details which, if Mellish's proposal is correct, must extend over so large a portion of the disc as to make one hesitate and wonder what is wrong." Thus Mr. O'Toole made a drawing of Ganymede with a 6-inch reflector in the summer of 1950, and with the aperture used any feature present must have had a width fully one-half that of the satellite if Mr. Mellish is correct. Nevertheless, the drawing shows three dark bands running across the disc, with intervening bright spaces. Where, Mr. O'Toole asks, is the discrepancy?

Elmer Reese Raises Some Objections. Mr. Reese's comments are so informative that we shall quote part of them:

"The effects of atmosphere, telescope, and observer on recorded planetary detail is a very interesting problem. I find it difficult to believe that the finest line or the smallest spot that can be seen on the surface of the moon or a planet with a given telescope can appear no smaller than the angular value given by Dawes' formula for the resolving power of a telescope. The constant used in Dawes' formula is empirical having been determined from the observation of bright diffraction discs against a dark background [stars on the sky] . Actually the diffraction disc decreases in brightness very rapidly from its center toward its outer edge. On a dark sky more of the fainter marginal area of the disc is apparent than would be the case on a bright lunar or planetary background. Might not the smallest planetary detail therefore appear smaller than the Dawes limit of resolution for double stars?"

Reese then says that Mellish's letters imply that the familiar Dawes Limit, 4.5" divided by the aperture in inches, is equal to the angular diameter of the diffraction disc of a star. However, Dawes Limit is really 85% of the radius of the diffraction disc, as is explained by H. Spencer Jones in an excellent article in J.B.A.A., Vol. 47, no. 1, and in "Physics by Hausmann & Slack.

"Experiments by D. W. Rosebrugh... and telescopic observations by several members of the A.L.P.O. clearly demonstrate that thin dark lines no wider than 1/10 of Dawes' Limit can be perceived when conditions are very favorable. Mr. Mellish admits that such thin markings can be seen, but contends that they can appear no thinner or smaller than the Dawes Limit. Dawes Limit for a 6-inch telescope is 0.76". On March 8, 1949 Cassini's Division in the ansae had a width of 0.46" according to the ephemeris. In front of the globe of Saturn this division had a width of only 0.08". In my 6-inch reflector Cassini's Division was clearly seen in front of the globe as an exceedingly fine, dark line certainly very much narrower than in the ansae. The Crape Band was also seen and estimated to be only 3/4 as wide as Cassini's in the ansae. Since all these features had widths far below Dawes Limit for a 6-inch telescope, they should have appeared equal in width only different in intensity according to Mr. Mellish."

Mr. Reese agrees that planetary observers often drew detail too small relative to the outline of the whole disc and that they should be on guard against this tendency.

Raymond Missert Offers Some Comments. This colleague remarks that the "black drop" effect at transits of Mercury can be reproduced simply by holding a thumb and a forefinger up to a bright background and then slowly bringing them together. The "black drop" leaps out to join the fingers just before contact. Mr. Missert thinks that there is no valid reason why Dawes Limit should be an infallible criterion for planetary resolving power. He would like to see the whole question of visual planetary resolution discussed in a suitable professional journal.

David W. Rosebrugh Also Objects. Mr. Rosebrugh does not agree with Mr. Mellish that a planetary marking must always appear as large as the Dawes Limit. He instead accepts the empirical evidence offered by Reese for Cassini's Division and by O'Toole for markings on Ganymede that features can appear smaller than the Dawes Limit, and he concurs with Reese that the outer and fainter portions of the spurious disc of a point-source of light may be invisible against a bright, planetary background. Rosebrugh also directs attention to his own experiments with detail on artificial discs as reported in The Strolling Astronomer for May, 1950, April, 1951, and December, 1951; these have given very strong evidence that markings can be seen when they are much smaller than the Dawes Limit. He says: "Cassini's Division in front of the ball is thin. It appears thin. It should be drawn thin."

Mr. Rosebrugh does not agree with Mr. Mellish's explanation of the "black drop" effect at transits of Mercury because he (Rosebrugh) saw no similar bright drop effect at a tangential occultation (as observed at Waterbury, Conn.) of Mars by the moon on February 24, 1948 when the limbs of the planet and the moon were in close proximity for a long time (The Strolling Astronomer, Vol. 2, No. 4, pp. 2-5, 1948). He does not regard the effect produced by placing two fingers together cited by Missert as germane to the argument.

Rosebrugh, a veteran variable star observer, also offers some opinions on suitable sizes of telescopes for the ordinary amateur. He thinks that a 6-inch is a useful maximum, in part because larger apertures are more difficult to use. Larger telescopes will be more sensitive to bad seeing than smaller ones, and reflectors will suffer more from this cause than refractors. In Rosebrugh's own experience a 6.2-inch refractor alsmost always surpassed an 8.8-inch reflector, even though the latter was by a famous maker and was of excellent optical quality. He thinks that a refractor is almost as good as a reflector of twice the aperture - thus a 12-inch reflector will show only a little more than a 6-inch refractor.

E. E. Hare Offers Some Remarks. Mr. Hare thinks that Reese's evidence in regard to Cassini's Division is just about fatal to Mellish's contention that features must appear as large as the Dawes Limit of the aperture. He continues: "There is a matter of possible interest to planetary observers which, to the best of my knowledge, has not been touched upon: Do dark markings have the same diffraction effects and limitation as white markings? We are all aware that dark planetary features are deficiencies in a field of light, and are not radiations of black light. Therefore the question arises whether diffraction effects increase or decrease the real width of a dark feature! Reese's classic exhibit - Cassini's Divison - seems to support the second thought."

(to be continued)

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