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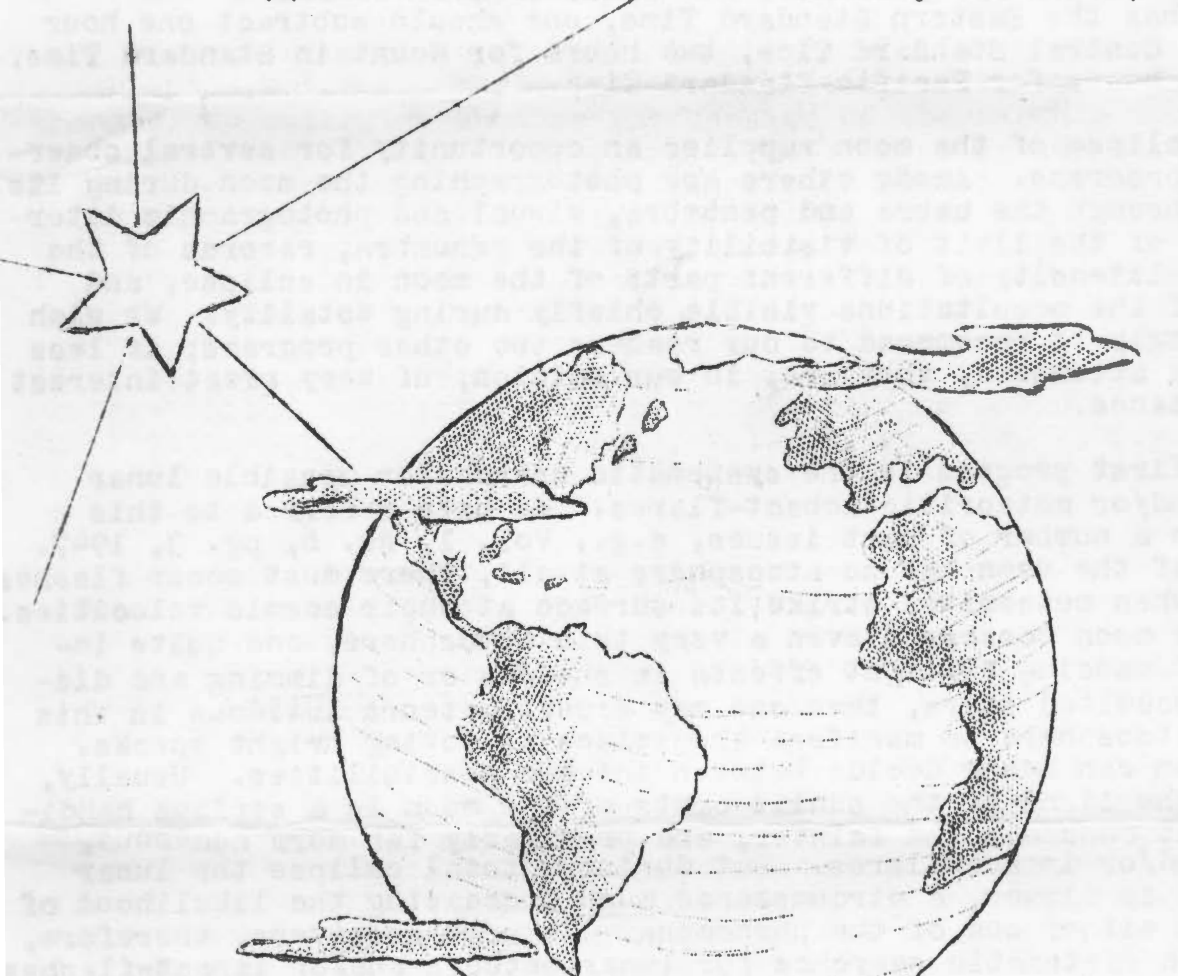

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THE APRIL LUNAR ECLIPSE

An outstanding astronomical event of the present month will be a total eclipse of the moon. Circumstances are as follows:

	Universal Time		Eastern Standard Time
Moon enters penumbra	April 13,	1h 32m	April 12, 8:32 P.M.
Moon enters umbra		2h 28m	9:28 P.M.
Total eclipse begins		3h 28m	10:28 P.M.
Total eclipse ends		4h 54m	11:54 P.M.
Moon leaves umbra		5h 54m	April 13, 12:54 A.M.
Moon leaves penumbra		6h 50m	1:50 A.M.

When one has the Eastern Standard Time, one should subtract one hour to obtain Central Standard Time, two hours for Mountain Standard Time, and three hours for Pacific Standard Time.

An eclipse of the moon supplies an opportunity for several observational programs. Among others are photographing the moon during its passage through the umbra and penumbra, visual and photographic determinations of the limit of visibility of the penumbra, records of the color and intensity of different parts of the moon in eclipse, and timings of the occultations visible chiefly during totality. We wish here strongly to recommend to our readers two other programs; if less frequently attempted, they are, in our opinion, of very great interest and importance.

The first program is the systematic search for possible lunar meteors and/or meteoritic impact-flares. We have referred to this subject in a number of past issues, e.g., Vol. 1, No. 6, pg. 3, 1947. Briefly, if the moon has no atmosphere at all, there must occur flashes of light when meteorites strike its surface at their cosmic velocities. But if the moon possesses even a very thin atmosphere, one quite incapable of causing twilight effects in shadows or of dimming and discoloring occulted stars, then one may expect meteors luminous in this rarefied atmosphere to manifest themselves as moving bright specks. Observation can hence decide between the two possibilities. Usually, however, the light of the sunlit parts of the moon is a serious handicap; for it conceals the fainter, and presumably far more numerous, meteors and/or impact-flares. But during a total eclipse the lunar background is dimmer, a circumstance much increasing the likelihood of witnessing either one of the phenomena. We urge observers, therefore, to carry on systematic searches for lunar meteors and/or impact-flashes throughout the period of totality. We recommend the use of a magnification low enough to show the entire moon. If any unusual bright spot is seen, it will be most important to record its exact time of appearance and its precise location on the moon (perhaps marked on a chart). This information is desired so that the results of observers simultaneously active can be compared. It would be a most important and gratifying result if two or more observers should record the same luminous phenomenon.

Readers participating in this program should report their name, station telescope, magnification, seeing (or steadiness), transparency (or clearness), the number of minutes spent in actual watching (as well as beginning and ending times of the searches), the region watched (if not the whole moon), the estimated stellar magnitude of the dimmest object that could have been detected, and their results. If any unusual luminous object is seen, they should also record its time of appearance, its position on the moon, its angular diameter, its estimated stellar magnitude, the length of its path, the lunar direction of motion, the duration of visibility, the color, and any other noteworthy characteristics. If the above appears like a large order, the editor will gladly supply to those requesting them blank forms for recording these necessary data.

The second program consists in the careful examination of certain lunar areas, which are suspected of exhibiting small-scale physical changes, to determine whether the passage of the earth's umbral shadow has any effect on them. For example, dark areas in the crater Eratosthenes go through a cycle of changes each lunation (W. H. Pickering, Popular Astronomy, Vol. 27, pg. 579, 1919); these have been ascribed both to some sort of lunar vegetation and to changing solar lighting. If varying solar illumination alone explains all such periodically changing areas, then no changes in them can occur as a result of an eclipse; but otherwise, some such effects, some deviations from normal development, appear very possible. It is known that rapid and extreme changes in the temperature of the moon's surface occur at eclipses (E. Pettit, Astrophysical Journal, Vol. 91, pg. 408, 1940.). At any rate, any changes clearly associated with the shadow's passage cannot be explained by changing lighting.

A person wishing to observe a lunar eclipse with this goal in mind should first select, from the list given below, some objects to be watched closely for eclipse-induced effects. Since affected regions have been found to change rapidly soon after emerging from the umbra (Harvard Annals, Vol. 51, 1903, and Vol 61, Part 1, 1908), one should study only a few objects, certainly no more than four. It is very desirable to be acquainted with the normal full-moon appearance of each object chosen (good photographs can help). If possible, each region on the program should be attentively examined at the moment it enters the umbra. Unfortunately, such pre-totality views will be difficult or impossible for Western U. S. observers at this eclipse because of daylight or twilight. It is absolutely essential to observe each region at the moment of re-entering sunlight and at brief intervals thereafter for several hours. If any abnormal or unusual appearances are detected during such post-totality observations, they should be studied with the greatest possible care. We urge each observer to employ the same telescope and eyepiece throughout this program. Two sources of uncertainty in deciding whether apparent changes are actual are thus removed; enough will remain! A power between 150x and 250x should be best on most ordinary-sized telescopes.

Each reported observation made in this program should be accompanied by a statement of observer, station, telescope, time, (to nearest minute), magnification, seeing, and transparency. It will be noted that all but three of these items can be made the same for all observations by one person.

There follows a list of lunar features suitable for study:

1. Linné. Watch carefully the size and brightness of the white area around this crater. Micrometrical measures of the north-south diameter by equipped readers are recommended.

2. Riccioli. Watch closely the south tip of the conspicuous dark area in this crater, and note its darkness. Micrometrical measures of the north-south length of the dark area are suggested. Note whether the south end is rounded or pointed.

3. Atlas. Watch the intensity and appearance of the two main dark areas on the floor, one near the south wall and one northwest of the central mountains. Pay especially close attention to dark bands or areas between these two in the west half of the floor.

4. Grimaldi. Watch for changes in the darkness of the floor, or parts thereof, and in the brightness of the bright spots along the west wall.

5. Stoefler. Examine carefully the dark areas on the floor, and compare the intensities of the ones in its east and west parts.

6. Eratosthenes. Estimate the intensities of the dark areas in the east half of the floor.

7. Alphonsus. Observe the intensities, sizes, and general appearances of the three very dark spots on the floor.

8. Plato. Note the relative conspicuousnesses of the spots and streaks on the floor. Watch also for possible changes in the darkness of the floor, or parts thereof.

9. Conon. Note the size, brightness, and general appearance of the floor "cloud", a variable white area connected to the northwest wall.

It will be best to make many of these suggested observations by comparisons to other lunar features not far away. For example, the intensity of dark areas in Atlas may be compared to that of the floor of Endymion and of the dark area in the north part of Hercules; and the size of Linné may be compared to that of any of a number of bright spots near it on the expanse of Mare Serenitatis. Such relative estimates of intensities and sizes are likely to allow far more definite conclusions about the effect of the eclipse than attempted absolute estimates. Lack of space prevents a detailed listing of suitable comparison-areas for each object on the program. We suggest that each observer choose ones for himself, either from good photographs of the full moon or from visual surveys during the days just before the eclipse. Such surveys have the merit of giving greater familiarity with the regions to be watched; it is easy to blunder in full-moon studies of imperfectly known areas.

We recommend that those persons watching three or less objects select all of them from the first six in our list. Those studying a fourth object should then choose it from among Alphonsus, Plato, and Conon. We hope that this haphazard system will secure sufficient observers for each feature on the list! We also hope that the atmosphere of the third planet will not exhibit Venus-imitating qualities on the night of April 12-13!

BOOK REVIEW
by
Hugh M. Johnson

"The Atmospheres of the Earth and Planets: Papers presented at the Fiftieth Anniversary Symposium of the Yerkes Observatory, September, 1947," edited by Gerard P. Kuiper, 1949, The University of Chicago Press, Chicago 37, VII + 366 pages, 91 Figures, frontispiece + 16 Plates, $7.50.

This is the first book, known to the reviewer, published since H. N. Russell's "The Solar System and its Origin", or F. L. Whipple's (nontechnical) "Earth, Moon, and Planets", and dealing only with the planets. It is a welcome and excellent addition to a restricted literature. A list of chapters and their contributors will give the best concise plan of the work.

I. Introduction, by G. P. Kuiper.
II. On the Nature of the General Circulation of the Lower Atmosphere, by Carl-Gustaf Rossby.
III. Scattering in the Atmospheres of the Earth and the Planets, by H. C. van de Hulst.
IV. The Upper Atmosphere Studied from Rockets.
  A. Research Programs, by J. L. Greenstein.
  B. The Ultraviolet Solar Spectrum, by H. E. Clearman.
  C. Rocket Sonde Research at the Naval Research Laboratory, by E. Durand.
V. Seasonal Variations in the Density of the Upper Atmosphere, by F. L. Whipple, L. Jacchia, and Z. Kopal.
VI. The Spectra of the Night Sky and the Aurora, by P. Swings.
VII. The Terrestrial Atmosphere above 300 Km., by Lyman Spitzer, Jr.
VIII. Geological Evidence on the Evolution of the Earth's Atmosphere, by R. T. Chamberlin.
IX. Rare Gases and the Formation of the Earth's Atmosphere, by H. Brown.
X. Selected Topics in the Infra-red Spectroscopy of the Solar System, by A. Adel.

On the Presence of CH_4 , N_2O, and NH_3 in the Earth's Atmosphere, by M. V. Migeotte.

XI. Spectroscopic Observations of the Planets at Mount Wilson, by T. Dunham, Jr.
XII. Survey of Planetary Atmospheres, by G. P. Kuiper.
XIII. Laboratory Absorption Spectra Obtained with Long Paths, by G. Herzberg.
XIV. Possibility of Photosynthesis on Mars, by J. Franck.

The text is not thickly mathematical, but the approach is that of modern astrophysics, and the nonmathematical reader must be content to skip parts. He would do well to prepare himself partially anyway, by reading Chapters XIV-XVII (in Volume II) of Russell, Dugan, and Stewart's "Astronomy", a work, incidentally, which is favored by repeated reference in the book under review. So new and astrophysical are the sources for "Atmospheres of the Earth and Planets", in fact, that the reader familiar with visual studies may pause over the absence of such names as W. H. Pickering, A. S. Williams, and R. Jarry--Desloges from the name index. He should easily recognize that this book represents a valuable supplement to his own diet, but he may wonder whether visual planetary work is now reciprocally nourishing to solar system astrophysicists.

The frontispiece is a very clear reproduction of the earth (Gulf of California and curved horizon background) photographed from a rocket. One of the 16 plates is four photographs of Mars by Carmichel and Lyot at Pic du Midi in 1941, while most of the others are spectrograms of the sun, moon, planets, and some of their satellites in a variety of wavelengths from ultra violet to infra red.

The format of the book is good in every respect.

Postscript by Editor. We strongly second Mr. Johnson's recommendation of Dr. Kuiper's book.

Apparently some astrophysicists consider visual planetary work of definite value. Dr. O. Struve in an article in Popular Astronomy, Vol. 51, pg. 469, 1943, regrets the decline among professional astronomers of this branch of the science as follows: "At some of our large observatories, lack of skill in visual methods has brought about stagnation in research on planetary surfaces--a field of endeavor which was of exceptional fascination to many of our predecessors. Schiaparelli and Barnard never missed a night of good seeing when Mars or Jupiter was in opposition!"

We think that our Association may thus have an important function to perform and that it may perform it the better as its members are the more acquainted with the methods and results of modern astrophysics.

ON THE WIDTH OF RING C

To introduce our subject to new readers and to refresh the memories of old readers, we begin with a brief historical sketch. In the autumn of 1947 the Crape Band on the ball, then supposed to be the projection of Ring C (the Crape Ring), appeared so extremely and unexpectedly narrow to a number of the most skillful and most experienced observers in the Association of Lunar and Planetary Observers that the editor was convinced that the ring had become narrower (The Strolling Astronomer, Volume 1, No. 9. pg. 1, and No. 10, pg. 2, 1947). Then E. E. Hare developed a theory according to which one actually often (perhaps always) sees the shadow of Ring C and not the projection of C itself (ibid., Volume 2, No. 3, pg. 1, 1948). A careful analysis by E. J. Reese of many estimates of the width of the Crape Band in 1946-8 strongly indicated that it is in fact the shadow of Ring C (ibid., Volume 3, No. 1, pg. 5, 1949). They clearly showed that it is not the C projection. The supposed narrowing in 1947 was now left quite uncertain because the shadow of C was narrower than the C projection in the autumn of that year. There is one time, however, when the shadow of C has the same breadth as the C projection; this happy moment occurs when the Saturnicentric latitudes of the earth and the sun are equal. Such equality existed at 15^h on February 18, 1949 (Universal Time here and later). In our February issue, therefore, we urged very careful estimates of the breadth of the Crape Band from February 14 to 24.

Results known to us were obtained in this interval by the following members:

Observer	Station	Telescope
T. Cragg	Los Angeles, Calif.	6-inch reflector
W. H. Haas	Albuquerque, N. Mex.	6-inch reflector
E. E. Hare	Owensboro, Kentucky	7-inch reflector
L. T. Johnson	La Plata, Maryland	10-inch reflector
E. J. Reese	Uniontown, Penna.	6-inch reflector

The individual observations are summarized below. In all cases the width of the Band was estimated at the central meridian of Saturn, and the unit of distance (1.0) was the width of Cassini's Division at the ansae.

February 15. Haas estimated the width to be about 2/5 in fairly good seeing.

February 17. Hare obtained 3/4; Haas, 2/5.

February 18. Cragg estimated 0.3. Hare again obtained 3/4. Haas estimated 1/3 to 2/5 (average 0.36). Reese in excellent views observed now 0.7, later 3/4 (average 0.72).

February 19. Haas noted: "The very dark Crape Band (seen well at times) is also very narrow, being only 3/10..."

February 20. Cragg recorded 0.3. Haas found "about 2/5" in a dense haze.

February 23. Johnson noted: "Crape Band seemed slightly wider than Cassini's at the ansae and was more conspicuous." Haas recorded: "The Crape Band is 3/10 as wide as Cassini's at the ansae, or perhaps as little as 1/4 (adopted value 0.28). The best views suggest extreme narrowness."

Perhaps the most evident conclusion is that the observers were able to disagree! One has as average values for each of them: Cragg 0.30 (2 estimates), Haas 0.36 (6 estimates), Hare 0.75 (2 estimates), Johnson slightly more than 1.00 (1 estimate), and Reese 0.72 (1 estimate). The average of the four who made definite numerical estimates is 0.53. This average is of uncertain meaning because of the wide divergence of the Hare-Reese-Johnson and Cragg-Haas schools of thought on the subject. Nevertheless, some rough computations may not lack interest. From February 15 to 23, the period of the observations, the numerical Saturnicentric latitude of the earth ranged from $8^{\circ}.8$ to $9^{\circ}.1$, a suitable average being $8^{\circ}.9$. The width of Ring C then comes out as (0.53) (cosecant $8^{\circ}.9$) = 3.43. One must next inquire about the width of Cassini's Division. Its breadth has been given by some authorities as 2900 miles, allowing for irradiation which presumably also affects the Crape Band; the corresponding breadth of Ring C is (2900) (3.43) = 9,900 miles.

There is an alternate method of finding the width of Ring C. During the present 1948-9 apparition White, L. T. Johnson, and Reese have estimated what portion Ring C occupies of the distance from the inner edge of Ring B to the globe. Most of their estimates of this ratio range from 0.40 to 0.45, with the best views near the latter value; we shall adopt 0.43. According to pg. 385 in Volume I of Astronomy by Russell, Dugan, and Stewart the distance from the inner edge of Ring B to the ball is 19,500 miles. The width of C is then (19,500) (0.43) = 8,400 miles. This figure is much more dependable than the 9,900 derived above, in the editor's opinion.

Both our values for the width of Ring C include the Fifth Division, a gap between Rings B and C. If we suppose its breadth to be 1,000 miles, then our figures become 8,900 and 7,400 miles respectively. P. Lowell's measures several decades ago made the width of C 11,500 miles; other past observers obtained 10,000 miles or slightly more (probably including the Fifth). The present results would thus appear favorable to a narrowing of Ring C by two or three thousand miles in the autumn of 1947, though they are not absolutely conclusive. Unfortunately, this program will have to be suspended for a while after the 1949 conjunction of Saturn because of the extreme narrowness of the rings.

OBSERVATIONS AND COMMENTS

Note. All dates and times are by Universal Time unless the contrary is explicitly stated.

Elsewhere in this issue we have spoken of the value of systematic searches of the moon for possible lunar meteors and/or meteoritic impact-flares. We were pleased to learn some months ago that the Glendale, Calif., amateur astronomers were doing group-work on this project. They are the only organization so engaged, to our knowledge. Their results have been indicated by Mr. J. G. Moyen of Hermosa Beach, Calif., in a letter dated February 7, 1949. We quote part of it:

"To date our members have reported two cases of momentary flashes of light on the dim portion of the moon's surface, which probably were evidences of meteors, at the following Pacific Standard Times:

"August 8, 1948. 21 hrs., 35 mins.
"December 6, 1948. 18 hrs., 44 mins.

"We had hoped to have 2 or more observers searching simultaneously so that reports such as these would be substantiated or authenticated should 2 or more observers report witnessing the phenomena at the same time. Unfortunately for each of the cases reported above only one observer happened to be watching, or at least only one reported seeing a flash at that time. In each case the flash was described as about 1/3 of the way from the edge and of magnitude 8 or 9. The telescope used in each case was a 10-inch of good quality. This is the largest reflector owned by any member, and the largest refractor is a 6-inch.

"I will confess that results to date have not been startling, but this may be attributed to the fact that not a great many hours of actual watching have been spent yet. Furthermore, we are all very new in this work and have taken some time to gain experience. There seem to be only 2 or 3 days each month when the moon is at the proper phase so that successful results are even possible, and very often the weather has interfered on those days."

If the 2 "flashes" seen by Glendale observers are moving lunar specks, known observations of such objects by our members and co-workers in the years 1941-8 total 19.

On pp. 3-5 of our January, 1949, issue we discussed the twin craterlets in the north central part of the floor of the lunar plain Plato. The twins are Siamese in that it takes a really good view to divide them. On February 12, 1949, at 3^h 15^m E. J. Reese made the following observation: "The components were equal in diameter, but the northeast component was decidedly the brighter. The distance between the centers of the components was estimated to be 1/4 the distance between the central craterlet and the southwest component, or about 1".9 or 2.2 miles." With fairly good seeing, he thus found these craterlets unusually easy to separate. One might compare this result to Reese's earlier estimate (see above reference) that the distance between the centers was "certainly less" than 1".4. Three days later, on February 15 at 11^h 22^m, W. H. Haas remarked in good seeing: "The north central pair is divided only by infrequent glimpses; and I feel unable to compare the components in size, brightness, etc." Since Haas had never before split the craterlets at all with his 6-inch reflector, we have here important confirmation that they were indeed unusually easy to separate last February.

On pg. 32 of The Journal of the British Astronomical Association for December, 1948, Mr. H. P. Wilkins reports some 1948 observations of bright and dark bands on the inner walls of the crater Proclus. He expresses surprise that such lunarians as Neison and Goodacre made no mention of these streaks and hence wonders whether they may be a comparatively recent development. In recent months Hare, Reese, White, and Haas have made observations, including drawings, of Proclus. These have apparently revealed the bands in question. For example, White on March 6 at 3^h 38^m drew a dark band on the north inner wall and two bright bands on the still shadowed west inner wall. Near the same solar illumination on August 11, 1948, Hare depicted two dark bands on the north wall, two more on the south wall, a faint dusky band on the east wall, and a relatively bright band in the shadow on the west wall. In February Haas observed the Proclus bands over widely varying solar lightings and found them always inconspicuous. In fairly good seeing at 5^h 13^m on February 9 he made a typical entry: "The dark wall bands are very inconspicuous, more so than those in Conon tonight." Since the wall bands in Conon--and for that matter in a number of other craters, among them Hansteen and Kepler--have not been mapped or described by past selenologists, Haas is of the opinion that the evidence for any change in the Proclus bands is inconclusive. F. R. Vaughn has expressed the same opinion in correspondence.

On pg. 4 of our March issue we described J. C. Bartlett's apparently remarkable observation on December 25, 1947, of a black area in the southeast part of the floor of Grimaldi. Having foreseen that the solar illumination of Grimaldi would be the same at 2^h 25^m on March 13, 1949, as when Dr. Bartlett observed, Haas decided to examine the walled plain on that date. His first view at 1^h 55^m on March 13 showed him a large area almost as black as shadow in the east part of the floor. It was not darker than the shadows of west wall peaks (as Bartlett had observed), and Haas wondered whether it might be merely a region very poorly lit by the sun. By 2^h 50^m it was considerably lighter than at 1^h 55^m; by 5^h 20^m, lighter still, though yet easily darker than the floor. At 2^h 50^m and later the area showed much internal structure, parts perhaps being shadow and parts being much lighter. At 3^h on March 14 no trace of the area remained. If it results merely from very oblique illumination, it must be present soon after every sunrise on Grimaldi. Good evenings to look for it during the coming months are May 10, July 8, and September 5 (local civil time dates).

Jupiter was observed by Haas on March 14, 18, and 19. The four chief belts in order of decreasing conspicuousness were: South Equatorial, North Equatorial, South Temperate, and North Temperate. On one date the Equatorial Band and the North North Temperate Belt were also seen. The South Equatorial Belt is double, at least in part. The North Temperate Belt is thin but fairly dark. The South Tropical Zone is easily the brightest zone. The Equatorial Zone is rather dim; the North Tropical Zone, dull. A dusky North Polar Region appears to extend as far south as the N. T. B., and a similar dusky South Polar Region likewise apparently reaches to the S. T. B. Averages of central meridian transits of the Red Spot Hollow on March 14 and 19 give these longitudes (II): preceding end 216°, center 230°, and following end 245°. The appearance of the Hollow is the same as described in our March issue, and the dark band outlining its following shoulder remains conspicuous.

Mercury will be well-placed in the evening sky from about April 25 to about May 15. (These dates are not the limits of the possible period of visibility.) This apparition is the best evening one of the present year. Among interesting observations are drawing the planet when any detail is visible and noting the exact observed phased outline from April 30 to May 7, (near half-phase) inclusive (local civil time evening dates).

A number of readers have expressed interest in the phenomena of satellite Tethys of Saturn, for which we gave some predictions not long ago, but have been unable to observe these events for various reasons. However, E. K. White with a 7-inch reflector followed Tethys as it neared its primary up to $6^h 40^m$ on February 27. A transit ingress was scheduled for $6^h 44^m$. Mr. White apparently saw nothing of the tiny shadow of Tethys, which began to cross the disc of Saturn at $6^h 43^m$.

Cragg, White, and Reese have seen Saturn so very well as to perceive Cassini's Division as a very thin line in front of the globe. The pattern of belts and zones is much the same as described in our March issue. E. Pfannenschmidt regularly observed the two polar shadings in December and January with a 3-inch Bardou refractor and perceived irregularities in the South Equatorial Belt--a very creditable view for so small an aperture. A good view by White may clarify certain puzzles in the group's recent work; on February 27 he saw the South Polar Band as a dark, wide belt separated by a dusky area from the south limb, which was tipped by a tiny and lighter cap. The space between the S. E. B. components is dusky. From February 26 to March 2 White found the Equatorial Zone "still very bright" and perhaps composed of "a number of bright large oval areas similar to Jupiter's E. Z." On March 4 Reese confirmingly noted: "Very brilliant spots are glimpsed in the north part of the E. Z...." Reese and Haas find the South Polar Band diffuse, and Haas observed the North North Temperate Belt to be faint and diffuse on March 22, invisible on other dates. Several observers agree that the ball is more dusky south of the S. E. B. than north of the rings. L. T. Johnson and White report that the North Temperate Belt is a little wider than several months ago.

Three drawings by L. T. Johnson show the Third Division in the rings very clearly; it is dusky, not black, with a breadth perhaps twice that of Cassini's. Encke's Division has now been "clearly visible to White on two dates as "a rather sharp dark line in Ring A," about 4/10 of the distance from the outer edge to the inner edge. Reese has recorded a brighter annulus at the inner edge of Ring A and a similar more brilliant annulus at the outer edge of Ring B. Both annuli are narrow, perhaps narrower than Cassini's Division. The one in A was observed by White, Haas, and others some years ago when the rings were widely opened.

We proceed to estimates of the width of the Crape Band on the ball, just south of the Ring B projection. The unit is the breadth of Cassini's at the ansae. L. T. Johnson obtained about 1.1 as the average of three estimates from February 23 to March 4. Reese secured 0.77 as the average of three estimates on March 4 and 8. The average of five observations by Haas from March 13 to 22 is 0.58. White estimated about 1.2 from February 26 to March 2. White had last observed the planet in November, 1948; he was surprised by how much the Crape Band had widened since then and by how nearly shadow-black it now is. The widening may be explained by the southward shifting in recent months of the shadow of Ring C; and the present near-blackness, which others confirm, may well be due to the fact that part of the Band is now the shadow of Ring B. On February 8 E. Pfannenschmidt wrote that German observers had seen Ring C at the ansae but had observed nothing of the Crape Band--further evidence, we think, of its extreme narrowness when the shadow of C was thrown northward.

S U B S C R I P T I O N R A T E S

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