The Strolling Astronomer

Volume 4, Number 6 June 1, 1950

ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS

Mailing Address

The Strolling Astronomer
Institute of Meteoritics
University of New Mexico
Albuquerque, New Mexico

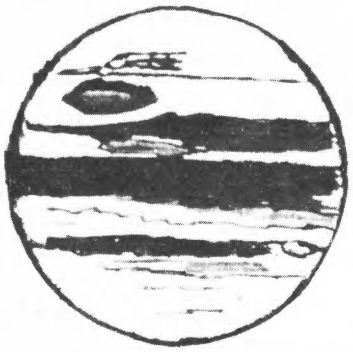
SUBSCRIPTION RATES

1 Year.....$3.00
6 Months..... 1.50
1 Issue.....(in print)..... .25

STAFF

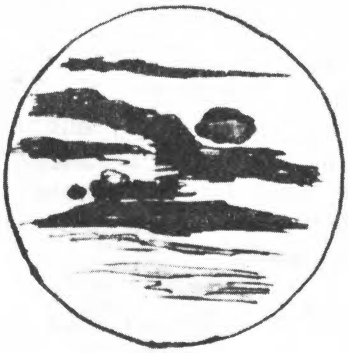
NOTICE: In order to facilitate the reproduction of drawings in future issues, readers are requested to exaggerate contrasts on drawings submitted. Extremely faint marks cannot be reproduced. Outlines of planetary discs should be made dark and distinct. Following these precepts will permit better reproductions.

REPRODUCTIONS OF DRAWINGS OF THE PLANET JUPITER SHOWING THE GREAT RED SPOT. DRAWINGS BY THE LATE PROFESSOR C.W. PRITCHETT, FROM THE PUBLICATIONS OF THE MORRISON OBSERVATORY, GLASGOW, MISSOURI



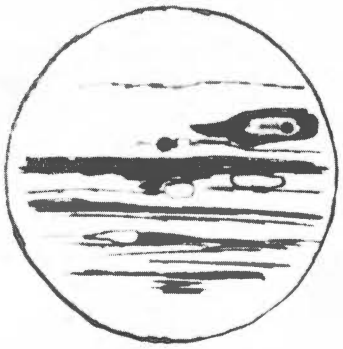
1885, May 3. 8hr. 10m., Loc.M.T.

Fig. I.



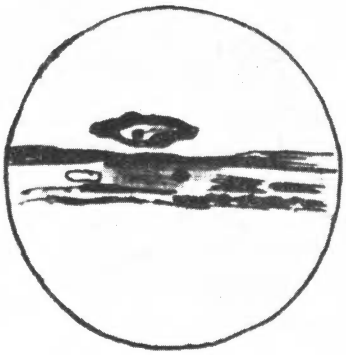
1878, July 9. 12hr. 18m., Loc. M.T.

Fig. II.



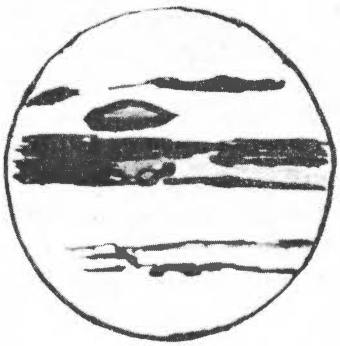
1881, Oct. 3. 14hr. 40m., Loc. M.T.

Fig. III.



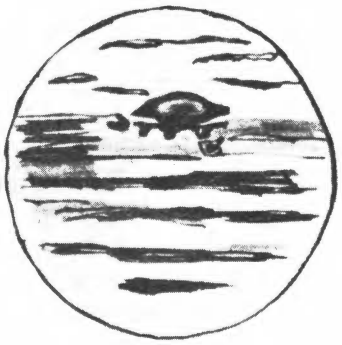
1880, July 10. 14hr.55m., Loc. M.T.

Fig. IV.



1880, Oct. 1. 8hr. 40m., Loc. M.T.

Fig. V.



1885, May 10. 8hr. 00m., Loc.M.T.

Fig. VI.

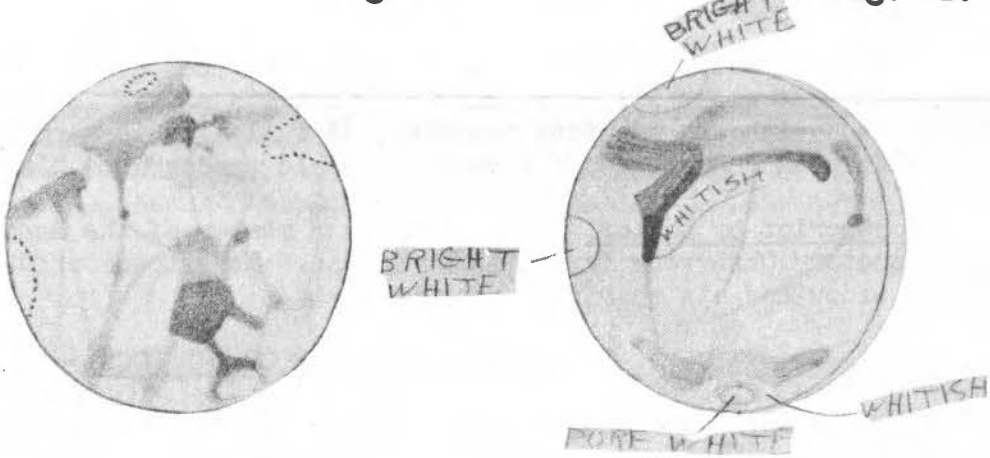


Fig. VII. Mars
E. E. Hare
12-in. refl.
April 2, 1950.
$5^h\ 46^m$, U. T.
375X, 525X.
C.M. = 30°.

Fig. VIII. Mars
W. H. Haas
6-in. refl.
April 14, 1950.
$8^h\ 26^m$, U. T.
300X
C.M. = 324°

HOWARD A. DELANO. 1885-1950.

by Theodore R. Hake

Howard A. Delano, dean of amateur astronomers in York County, Pennsylvania, died suddenly at his residence on May 25, 1950. He is survived by his widow, Mrs. Cora Delano, and two brothers residing in New England. Mr. Delano was born in Massachusetts on January 24, 1885, to parents that had only the sea as a home for long periods of time; and it was his early interest in navigation that gave him his first love of astronomy. He later broke away from the sea long enough to be educated at Massachusetts Institute of Technology, but the sailing of motor launches stayed with him as a prime interest up to within a few years of his death.

Mr. Delano came to York around 1914 and for 30 years before his recent retirement was head of the Engineering Department of the American Chain and Cable Company. It was here that the writer made his acquaintance, and at that time Mr. Delano already owned a 3" Bardou refractor. In 1944 he acquired a 4 1/2" Clark equatorial refractor and promptly made patterns for non-corrosive castings for a new mount that was machined in his own workshop. This mount was left out of doors on a steel pier for solar and planetary work until Mr. Delano designed and built an observatory and shop at his new residence at Stony Brook, Pa. This observatory was the first in York County, and it was designed to house a 12" reflector that he was planning to build in his fully equipped machine shop. This was to be the culmination of all his dreams after retirement, and with his passing his friends shared that loss as "Del" never turned anyone away that wanted to see the heavens. The closest of his friends knew that he enjoyed himself the most when he shared his hobbies, and he lectured frequently to create interest in astronomy. The tools and ornaments of all kinds such as weather vanes, sun dials, and navigation instruments that were made in his shop were freely distributed and stopped only when he ran out of material at times.

Mr. Delano was active in civic affairs and in the Lutheran Church. He was one of the founders and the first president of the York Engineering Society as well as a member of the York Rotary Club, Zeredatha Lodge 451, Harrisburg Consistory, and the Zembo Shrine.

Everyone that knew Mr. Delano found him to be generous to a fault and a gentleman that spoke ill of no man. His actions always set a Christian example; and although he often remarked, "A full life is more important than a long life", his many friends mourn what would appear to be his untimely passing.

Postscript by Editor. Mr. Delano was a member of the Association of Lunar and Planetary Observers from its foundation. We extend our deepest sympathy to his widow and his surviving brothers.

YOU SHALL HAVE A MAP OF THE MOON

In our April issue we inquired of our readers whether they would like to see the H. P. Wilkins map of the moon reproduced serially in The Strolling Astronomer. All who have written about the matter have heartily endorsed this proposal; we have 20 or more such responses. We are glad to say that we have accordingly decided to go ahead and reproduce the Wilkins map in this periodical.

All members of the A.L.P.O. will thus obtain the best existing map of the moon without extra charge in the course of subscribing to The Strolling Astronomer for two years at a cost of six dollars. It is our plan to reproduce a sample portion of the map in our next issue, the one for July. We intend to begin the regular serial reproduction of all the sections with the October, 1950, issue.

A few readers have expressed concern lest the reproduction of the map may crowd out the page of illustrations now a regular feature. We desire and hope to be able to include both. The final policy, however, will depend upon you, our readers; it is a matter of costs. If all present members renew their subscriptions promptly as they lapse and if we can get a fair number of new members who would like to have the map, then it will be easy for us to give you both features each month.

Mr. R. A. Wright of Worcester, Mass., who is perhaps best known as the producer of Astronomy Charted, points out that some might prefer to receive their map of the moon flat and unfolded. That means, of course, that each issue must be mailed in a larger envelope during the period that the map is being published. We have priced envelopes large enough to contain an unfolded issue of The Strolling Astronomer and offer this service to our readers for one dollar. (The special envelopes will be used only while the map is appearing.) This sum must be received before September 15 if you do not wish us to employ the regular envelopes for your map.

It is, of course, only proper that we should all thank Mr. Wilkins for graciously permitting us to issue his map via The Strolling Astronomer.

SECOND CONFERENCE OF WESTERN AMATEUR ASTRONOMERS

This conference will be held at Palo Alto, Calif., on August 14, 15, and 16, 1950. The host society will be the Peninsula Astronomical Society. It is hoped that many members of the A.L.P.O. will be able to attend. Perhaps your summer vacation can be so planned that you will be at Palo Alto in mid-August. Mr. H. A. Wallace recently wrote us about this Conference as follows:

"Stanford University has kindly provided facilities on its campus for living quarters, meals and halls sufficient for the entire attendance.

"Stanford University and the Astronomical Society of the Pacific will jointly present the 'Story of Palomar' film, with a talk by Dr. Seth B. Nicholson of Mount Wilson and Palomar Observatories. This feature of the Conference, in the evening of Tuesday, August 15th, is to be open to the general public.

"In addition to the trip to Lick Observatory, the well-known Santa Clara College Observatory will be visited earlier the same day, August 16th.

"Further information may be obtained from the [Peninsula Astronomical] Society, 922 Roble Ave., Menlo Park, Calif."

Foreword by Editor. The following article by Mr. Russell C. Maag, 611 Bluff St., Fulton, Missouri, is the first of its kind to appear in The Strolling Astronomer. We like to offer our readers a varied astronomical diet, however; and we think that this article on early observations of the Red Spot

of Jupiter in this country will be of much historical interest. The numbered sketches to which Mr. Maag refers are on pg. 1 of this issue. We have not found explicitly to what meridian the local mean time of the sketches refers; however, on pg. 514 of the 1950 A.E.N.A. the longitude of the old Morrison Observatory at Glasgow, Missouri is given as 6 hrs., 11 mins., 18 secs.west.

SOME EARLY OBSERVATIONS OF THE RED SPOT OF JUPITER

by Russell C. Maag

The first volume of the "Publications of The Morrison Observatory" covers the work of the first Director, Prof. Carr Waller Pritchett, and his two sons, C. W., Jr., and Henry. The work begins with the founding of the observatory in 1875 and goes to 1887, when the publication was printed by the press of Thos. P. Nichols of Lynn, Mass. There is no copyright.

Prof. Pritchett studied astronomy at Harvard under the Bonds, Profs. Runkle, and Asaph Hall. His work was done chiefly in the fields of planetary, double star, and cometary phenomena. Among many other interesting accounts of observations is that of the first observations of the "Great Red Spot" of Jupiter, and I thought that members of the A.L.P.O. might find this account interesting reading. This account in more detail is also given in the British Society's publication, "The Observatory", for January, 1879 (No.21). Thinking that most A.L.P.O. members might not have had a chance to read either of these accounts, I quote directly from Pritchett's account, beginning on page 78.

"For Two-Hundred Years past observations of the gigantic planet Jupiter have been first in order, with all who possessed the means of making them. His broad and verigated disc, his great belt system and his ever changing satellites, have been observed and drawn thousands of times and yet the attraction is ever new and resistless for every amateur. During the past seven years, observations on Jovian phenomena have been greatly stimulated by the appearance and persistence of the 'Great Red Spot' which came under observation in 1878, July. Some astronomers have taken considerable pains in looking up evidence for its previous existence, and for its periodical returns. There is indeed no trouble to refer to previous markings, which resemble more or less strikingly in form and color, this spot; but all evidence connecting them with the 'Great Red Spot', is almost fatally impaired by the rapid drift of nearly all spots on the Jovian surface. The red spot has been comparatively stable; yet even this great land mark has so retrograded that the axial rotation of the planet as determined from it, differs nearly five seconds of time between 1878-79 and 1884-85. All who have taken the pains to compare for themselves its position at various dates relative to Mr. Marth's*zero-meridian, must be satisfied either that the spot stable as it has seemed, has actually drifted in the Jovian atmosphere or if solid land, as some maintain, that the elliptical aperture in the cloudy covering has drifted and exposed different parts of the red-hot surface of the Planet .....

"The first observations of the great red spot obtained in the NORTHERN HEMISPHERE were made at the Morrison Observatory July 9, 1878. An account of the observations together with a sketch is published in the 'Observatory' for January, 1879 (No. 21).

"During the years 1884-85, the red spot lost considerably in redness, especially in the central regions. On the best nights it now shows (June 1885), an interior white oval, surrounded by an elliptic ring of pale red, sometimes

*Mr. A. Marth, article in "MONTHLY NOTICES", Vol. XLI.

very dull red, and then again the color seems to brighten to a pink tint. But it preserves its distinct outline and environment almost unchanged. It seems to have formed for itself a peculiar recess or shoulder on the south side of the south equatorial belt. Into this curving recess it fits, and has fitted for years past. It is surrounded by a very fine white border, which completely isolates it from the belts both south and north of it. On the south side of it there is a narrow and very variable belt, which sometimes assumes a hue almost blue, or between blue and black. This belt approaches the spot so closely, that some experienced observers in 1884 reported the spot as joined to the belt. I can well conceive, that with low powers or with small instruments, an observer should reach this conclusion. In April and May, 1885, the atmospheric conditions being very favorable, I made a special study of this spot relative to its connection with contiguous belts. With a power of 275 (using the Clark 12"), on every occasion, a clear white border could be seen running entirely round it; but this border is perceptibly narrower on the south, than on the north side. On May 3, after satisfying myself fully on this point, I requested my son, C. W. Pritchett, Jr., (who has had much experience in observing), to scrutinize the environment closely. He did so, and at my request, made the drawing No. I. He was very positive as to the total separation of the spot from the belts. At the same time he recognized the interior white oval, and the darkening at the extreme following end. The drawing No. II., is a reproduction of that published in the 'Observatory' for January, 1879; and shows the spot and belt system as they appeared July 9, 1878.....

"Sketch No. III. is for October 3, 1881. It exhibits not only the belt system and spot, but Satellite I, and its shadow in transit. It also shows the needle like projection, to the preceding end of the spot, which has so often been observed. It will be noted that the shadow of the satellite is projected on the red spot. Similar projections have been noted several times. Some astronomers insist that there is quite a difference in the darkness of the shadow when projected on the spot, and on zones of the planet; but I have watched them closely, and frequently, without being able to detect it, even when looking expressly for it.

"Sketch No. IV is for July 10, 1880. The shadow of II, is near the preceding end of red spot. The drawing exhibits an unusual structure of the belt. The notebook says, 'There seems a remarkable absence of belts in the northern and southern hemispheres. The surface there seems more luminous than usual; while one notable white spot exists in equatorial belt directly north of preceding end of red spot. There is a trough-like appearance between the belts reaching to the eastern limb. The margin of northern and southern limits of belts is very even and dark; the southern limit has a tinge of blue. The shoulder or recess near following end of red spot almost obliterated.'

"Sketch No. V shows the appearance of the belt system October 1, 1880. The definition was exceedingly fine. The notebooks says, 'The belts are densely massed together, and very brown. The trough between the two main equatorial belts filled with loose gray matter. A peculiar cusp-like ridge curves northward from near the following end of red spot. The upper end gathers into a black knot like the shadow of a satellite, but smaller. Then a gray ridge-like shape passes down across the belts, as if a mountain chain branched off from a black peak.'

"Sketch No. VI. is for 1885, May 10, and is to show (in contrast with IV and V) how numerous the belts become on some fine nights.

"These few sketches have been selected from a great multitude. Some of the minor changes and omissions which they reveal are doubtless due to atmospheric conditions under which we see the planet; but the more noteworthy are indications of the astonishing changes which take place on Jupiter himself.

"Dimensions of the Red Spot: Micrometer measures of the dimensions of the red spot have been often made at this observatory. A mean of those made for the years 1879-80, gives for the major axis 13".6, and for the minor 3".98. For several years these measures were repeated frequently. Before using measures of different dates in discussions relative to the constancy of the spot and the persistence of its dimensions, we must remember that the apparent diameter of Jupiter is about 10" greater at his perigee than at his apogee; and therefore angular measures of the spot made at different distances must be reduced to a common unit of distance - say the mean distance which is about 5.01. At the mean distance 1" subtends at the center of the Jovian surface, about 2500 miles. The 'Great Red Spot', therefore extends in length about 33,000 miles and in width more than 8,500 miles, and its surface bears to the entire surface of our globe about the ratio 27:20."

BOOK REVIEW

by Walter H. Haas

"The Planet Mars", by Gérard de Vaucouleurs. Translated into English by Patrick A.Moore, F.R.A.S. Sold by Faber and Faber, Limited, 24 Russell Square, London, W. C. 1, England. Price 10 shillings, 6 pence net (or close to a dollar and one-half at the present rate of exchange). 87 pages, 5 plates of illustrations, 5 figures. Published in March, 1950.

The book being reviewed appeared in French as "Le Problème Martien" several years ago. Mr. de Vaucouleurs is an astronomer at the Observatoire du Houga and Secretary for the Commission for the study of Mars of the Société Astronomique de France. The translator, Mr. Moore, is a member of the British Astronomical Association and of the British Interplanetary Society. The translation has been thoroughly revised and brought up to date by Mr.de Vaucouleurs.

This excellent little book deserves to be read and studied by every serious student of Mars. The author's style is concise and compact. His general approach to "the Martian problem" is that of modern astrophysics. Though he considers that visual and qualitative methods still have their place in research on Mars, he thinks that the future belongs to the more refined astrophysical techniques. His knowledge of the literature on Mars is obviously vast, and some of the studies he cites are apparently little known in this country. His account is unquestionably an authoritative one of present knowledge of the planet.

Plate I is a map of the planet, partly from the author's own observations. Plate II shows seasonal changes in the size of the south cap and the differing appearance of a yellow cloud on simultaneous photographs with infra-red and ultra-violet light. Plate III consists of six photographs of the planet and demonstrates how the atmosphere of Mars is occasionally unusually transparent in blue light. Plate IV shows variations, both seasonal and less regular, in several selected regions of the planet. Plate V relates to the puzzle of the nature of the canals.

Space will not permit more than a brief outline of the contents of the book. Like many others, the author finds it best to assume the existence of both atmospheric and surface polar caps. The spring and summer shrinkage is probably accomplished more by sublimation into water vapor than by melting into liquid water. The surrounding dark "melt-band" is a real feature and not just a contrast - effect during the period that the cap is melting rapidly and may represent moistened ground. Spectroscopic studies show that the atmosphere of Mars contains less than 0.1% as much oxygen and less than 5% as much water vapor as does that of the earth. Perhaps the oxygen has been converted to ozone and has oxidized the surface of the planet. It is known from other evidence that water vapor cannot be totally absent. The Martian atmosphere contains about twice as much carbon dioxide as does our own. Probably nitrogen is the chief constituent, as with the earth. A "violet layer" of unknown composition five to ten miles above the surface usually conceals on blue and violet photographs the details seen visually. The atmospheric pressure at the surface of the planet is probably 2-2.5 inches of mercury, or 1/15 of our own. This low pressure would still permit liquid water to exist on Mars at temperatures below 40° C. After discussing temperature measures, the author concludes that "the Martian climate is of an exaggerated continental type", with very pronounced variations from day to night and, in the polar regions, from summer to winter. The dark regions and their seasonal and non-seasonal changes may admit of other explanations than vegetation. These features turn brown (as a rule) when the spring wave of darkening reaches them. This wave of darkening moves at a speed of about 28 miles per day and may be caused by water vapor in the lower atmosphere diffused outward from the melting polar cap. The expansion of certain dark tracks, such as Hellespontus, has a rate of about 11 miles per day, perhaps slow enough to be explained by capillarity transporting a liquid stream on the ground. A discussion of the puzzling canals presents the views of both "canalists" and "anti-canalists". The reviewer would lay more stress on the presence of canals on Lowell Observatory photographs (which he has seen at that Observatory) than the author does. He can, however, only heartily endorse Mr. de Vaucouleurs' appeal that the different schools of thought might gain more by searching for common grounds of agreement than by engaging in interminable controversies.

The reviewer has found a few minor errors. On pg. 24 the latitude of the center of the remnant of the south cap should be given as 83°, not 7°. On Plate II the heliocentric longitudes and figure-numbers are interchanged in the two top rows. On pg. 48 it is really the rising sun, not the setting one, which raises a diffuse arc. On pg. 61 the reference should be to figs. 11 and 12. A little more text might aid in interpreting Figure 5 on pg. 67.

There is no doubt that in this book Mr. de Vaucouleurs has rendered a real service to all students of Mars. The reviewer recommends it highly.

SOME UNUSUAL OBSERVATIONS

The interpretation of the following observations is uncertain; they are in the past, and there is no possibility of learning more about them. Nevertheless, the editor thinks that it may be well to put them on record. It has long been his feeling that it is better to report phenomena not understood than to suppress them.

On pg. 8 of the May issue we referred to a transient very brilliant spot seen on the limb of Mars by an amateur astronomer in Japan. In a letter written on May 18 Mr. Tsuneo Saheki has supplied more details about this object.

The observer was Mr. Tatsuya Matsuda. The spot was remarked at $11^h\ 40^m$, U. T., on March 24, 1950, in poor seeing with a 6-inch reflector at 146x. Mr. Matsuda continued to watch Mars until $13^h\ 0^m$ but did not again see anything unusual. Mr. Saheki suggests that the object may have been a meteor in the earth's atmosphere or even an illusion due to the brilliance of Hellas (near which the spot lay). The spot looked brighter than the disc of Mars.

Mr. Saheki in his letter then goes on to report a similar, but more certain, phenomenon observed by Mr. Sizuo Mayeda in 1937 near the north-northeast limb of Mars (the sunset limb). This spot was very brilliant, more so than the north cap; it remained visible for five minutes and during this interval shifted its position relative to the east limb because of the rotation of Mars.

In several issues we have referred to a moving dark object seen against the moon by J. J. O'Neill on October 2, 1949 (E. S. T. date). This object has been interpreted as a meteorite outside the earth's atmosphere. Two A.L.P.O. members have recently communicated somewhat similar observations.

T. Cragg observed a moving dark object against the sun at the Griffith Observatory in Los Angeles when Mercury was in transit on November 11, 1940. The solar image was projected on a screen. When the planet had gone somewhat more than halfway across the sun's disc,... "there was a small object which crossed the Sun in about 2 3/4 seconds. The object was black against the sun's disc, rough in shape, and rotating. It was just a slight bit larger than Mercury on the disc. I am almost dead positive that the object was NOT a bird." The diameter of Mercury was 9".9. The angular velocity of Cragg's object was apparently comparable to that of O'Neill's object.

On April 2, 1950, at $4^h\ 8^m$, U. T., E. E. Hare at Owensboro, Kentucky observed a black object to cross the telescopic field of view, of angular diameter five minutes, while he was observing the Plato region of the moon. He was employing a 12-inch reflector at 300x. The object moved surprisingly slowly, at an angular speed of about 46 seconds of arc per second of time. Its shape was bar-like, with small projections on a side at each end; and its length was estimated as 7 seconds of arc, a value within 20% of the true size in Hare's opinion. The object moved steadily and in a straight line due east (lunar east?), that being the direction of its own length. The object was in sharp focus. Hare saw the shape distinctly with the high magnification and was not at all reminded of a bird. But if the object is nevertheless interpreted as a bird six inches long, then he computes that it was three miles away and 12,000 feet above the ground and that its apparent velocity was $2\frac{1}{2}$ miles per hour.

In correspondence last autumn Mr. O'Neill conjectured that observations of dark objects against the moon were perhaps really fairly common. It looks as if this opinion may be vindicated.

SATURN IN THE SPRING OF 1950

During the last two months Saturn has been observed by J. C. Bartlett, Jr. (3.5-inch reflector), P.D. Bevis (6-inch reflector, 10-inch reflector), T. R. Cave, Jr. (8-inch reflector), T. Cragg (6-inch reflector, 12-inch refractor), S. Ebisawa (7-inch reflector, 13-inch reflector, 18-inch reflector), P. F. Froeschner (6-inch reflector), W.H.Haas (6-inch reflector), E. E. Hare (12-inch reflector), M. B. B. Heath (10-inch reflector), L. T. Johnson (10 -inch reflector), S. Murayama (8-inch reflector), D. O'Toole (6-inch reflector),

T. Saheki (8-inch reflector), W. W. Spangenberg (4-inch refl.) S. C. Venter (12-inch reflector), E. K. White (7-inch reflector), and H. P. Wilkins (15-inch reflector) -a pleasing total of 17 observers in six different countries.

A discussion of the Crape Band, the shadow of the rings, and the shadow of the ball when they were near the limit of visibility in February and March, 1950 will be deferred to a future issue.

In previous issues we have described a darker section of the North Temperate Belt South having a very remarkable rotation-period. This darker section is shown plainly on Figure 3 on pg. 1 of the May issue; the belt containing it is the first one to the north of the projected rings. First seen on November 3, 1949, the darker section then had a normal rotation-period of 10 hrs., 14 mins.; this period then decreased, but by no means at a uniform rate, and by the middle of March, 1950, had reached the very amazing value of 9 hrs., 35 mins. It is the editor's interpretation that the following central meridian transits refer to this same darker section.

Observer	Date	Prec. End Central	Fol. End Central	Conditions
O'Toole	1950, Feb. 18	$6^h\ 37^m$, U.T.		very good
Haas	April 1	6 29		rather poor
Haas	April 5	6 12		rather poor
Haas	April 7	5 38	$6^h\ 34^m$, U.T.	poor
Haas	April 11	6 12		poor
Haas	April 15	6 11		bad

Perhaps the observation of April 7 is in error; for if we omit it, these and past transits are consistent in indicating a period of 9 hrs., 35 mins. from March 14 to April 5 and one of 9 hrs., 36 mins. from April 5 to 15. It may be that the position on April 7 was temporarily shifted by the influence of another darker section in the belt, seen a little following this section from April 1 to 11 and having a period of 9 hrs., 35.1 mins. from April 5 to 11. Our confidence in our identification of the darker section first observed last November, and hence in the extraordinary rotation-period here ascribed to it, is strengthened a little by the fact that on April 7 a small dark spot was perceived at its preceding end (as also in some past views) and that such a spot was suspected in the same position on April 11 and 15. Although the darker section was not observed after April 15, its date of disappearance is very uncertain. O'Toole's February 18 transit was of a bend where the belt became darker. Most observers did not distinguish the darker section, even when it must have been well-placed on the disc and when the view was good. Hare with his 12-inch reflector on March 9 found the N. T. B. to look "curdled" in one or two places. On April 7 Haas saw the terminal ends of the darker section more clearly than in February and March, perhaps a very temporary aspect.

Several observers have continued to examine the relative brightnesses of the east and west arms of the rings with color filters. Haas made 22 such observations from March 25 to May 19. In 18 of them he found the east arm (right in simply inverted view) to be (usually only slightly) the brighter with Wratten Filter 47 (blue). There was little or no difference with other filters or without a filter except that when the east arm was the brighter with 47, the west arm was likely to be the brighter with a deep red filter, and conversely. After the middle of April Haas sometimes found the east arm to be

plainly and distinctly the brighter with Filter 47. Since the west arm was usually the brighter with a blue filter before opposition, this reversal of relative brightnesses after opposition suggests to him that the explanation of the phenomenon is to be sought merely in the relative positions of Saturn, the sun, and the earth. However, the work of other observers does not appear to be confirmatory. Johnson found the ring-arms alike on March 31, May 12, and May 14 with several different color filters; to be sure, his blue filter is a Kodachrome filter which transmits some light of all wavelengths. White in February found the two arms equal in color and brightness. Using filters, Bartlett compared the two arms 7 times from March 29 to May 2. The west arm was the more blue (brighter with blue filter) on March 29 and April 3, while the east arm was then the more red. On April 27 the colors were just the opposite. In his other views Bartlett saw no difference. On March 29 Bartlett and Haas independently examined the ring-arms with filters about 50 minutes apart and agreed in making the west arm the more blue and the east arm the more red. Dr. Bartlett points out that the phenomenon under discussion is presumably the one he called attention to on pg. 16 of Sky and Telescope for April, 1945. He now doubts that the effect can be entirely an illusion since color filters "certainly do indicate an objective difference in color." He has found rapid changes in the colors, and Haas has likewise sometimes observed marked differences when viewing the ring-arms a few hours apart on the same night. Bartlett thinks that the puzzling and varying colors exist chiefly on Ring A.

The numerical Saturnicentric latitude of the earth reached a maximum value of only 4°.8 in the middle of May, and the rings are now closing again. All observers easily saw Cassini's Division at the ansae. Cragg, Hare, and Johnson saw Ring C clearly at the ansae. Cragg and Johnson caught glimpses of Encke's Division in Ring A and of one or two divisions in Ring B. Johnson was even able to see that Ring B was brightest at its outer edge and that Ring A was brightest at its inner edge, aspects apparent enough some years ago when the rings were widely opened. A few observers sometimes saw the "Terby White spot" as a small bright area on the rings beside the shadow of the ball. It is usually regarded as a contrast-caused illusion. The rings grew more and more dim from March to May, for they were increasingly poorly illuminated as the numerical Saturnicentric latitude of the sun decreased from 2°.9 on March 18 to 1°.8 on May 29. Johnson considered the rings less bright than the ball as early as March 31, and Hare easily perceived Rings A and B to be less bright than the dusky limbs of Saturn on April 24.

The Equatorial Zone continued to be the brightest part of the ball, Cragg and Haas finding it brighter in its north half than in its south half. The North Tropical Zone, lying between the projected rings and the N.T.B., usually ranked second in brightness; but after the middle of April Haas sometimes found it comparatively dull. On April 7 and 11 Cragg recorded what he took to be a thin strip of the brilliant E. Z. to the north of the projected rings, and he writes that on April 7 Mr. Paul Roques photographed the E. Z. there with the Griffith Observatory 12-inch refractor. On this date the Saturnicentric latitude of the earth was 4°.3 S. If such a north edge of the E. Z. was at a fixed latitude, it should have been seen more easily last autumn and winter than this spring since the rings were then more nearly edge-on. The South Equatorial Belt was the most conspicuous belt, followed by the North Temperate Belt. Both were seen doubled in the better views except that the north component of the N.T.B. became faint and unnotable after about the middle of April. As a result, Cragg, Johnson, and Haas thereafter often saw the N.T.B. single and narrow. The spaces between the S.E.B. components and the N. T. B. components were dusky. The south component of the N.T.B. was frequently the darkest

belt on the planet. The shaded South Polar Region was darker and more definite than its northern analogue.' A number of the observers saw one or two inconspicuous belts between the S.E.B. and the S.P.R.; there were similarly one or two undistinguished belts in middle northern latitudes. On April 18 Cragg perceived a very thin Equatorial Band' just to the south of the Crape Band-thus not in the middle of the E. Z. as in past views this apparition Wilkins, Bartlett, O'Toole, Ebisawa, and Cragg saw such fine details on the ball as darker knots and spots in belts, bends in belts, humps along belt-edges, and brighter spots in zones. We emphasize again the value of obtaining central meridian transits of any recognizable Saturnian feature. We emphasize again the even greater value of obtaining a second transit of the feature, then a third, etc. Make a special effort! It is worthwhile when we know so little of clouddrifts at the planet's surface. One transit just doesn't supply a rotation-period any more than a single observation of a meteor determines its height.

The Crape Band was very dark and very prominent after the middle of March, almost as black as shadow (which indeed it was, but partly of Ring C) and much more conspicuous than any belt. The Band looked grayish brown to Bevis and a rich, dark red-brown to Haas in his better views but merely black to Hare after March 10. On pg. 11 of the April issue we reported Hare's surprising observation of a doubling of the Crape Band. Writing on April 25, Hare himself explained the mystery; the north element was the projection of Rings A and B, dark because less luminous than the globe of Saturn, while the south element was the usual shadows. Haas may have seen something of the same appearance. It is not too easy to explain why the array of rings and shadows looked double; possibly part of Ring B remained bright in front of the ball to form a separating lane. Other observers, however, apparently had no trouble in distinguishing between the dusky projection of Rings A and B and the darker shadows or even - so several persons apparently thought - between the Ring C projection and shadows to its south. The editor doubts that the C projection was actually observed, though; for it was invisible when it stood alone just south of the projected Rings A and B late in 1949.

On April 7 near $8^h\ 30^m$, U.T., T. Cragg used the filar micrometer on the Griffith Observatory 12-inch refractor to measure the latitudes of the belts. The editor has reduced his measures and has found these Saturnigraphic latitudes: N. edge N. component N.T.B, 23°3 N; S. edge S. component N.T.B., 11°1 N.; S. edge (brilliant part) E.Z., 13°4 S.; N. edge N. component S.E.B., 19°2 S.; S.edge S. component S.E.B., 28°7 S. These values should be compared with the ones Cragg obtained on February 18, as reported on pg. 12 of our April issue. Perhaps some of the differences are too large to be chance errors.

POLAR CAPS AND CLOUDS ON MARS

During the last month we have received observations of Mars from these colleagues: D. P. Barcroft (6-inch refl., 10-inch refl.), J. C. Bartlett, Jr. (3.5-inch refl.), P. D. Bevis (6-inch refl., 10-inch refl.), T. Cragg (6-inch refl.), T. Curren (20-inch refr.), S. Ebisawa (8-inch refr., 7-inch refl., 13-inch refl.), W. H. Haas (6-inch refl.), M.B.B. Heath (10-inch refl.), T. Howe (1.5-inch refr.), L.T. Johnson (10-inch refl.), R.R. Lee (13-inch refl.), S. Murayama (8-inch refr., 8-inch refl.), D. O'Toole (6-inch refl., 8-inch refr.), E. J. Reese (6-inch refl.), T. Saheki (8-inch refl.), and S. C. Venter (12-inch refl.) - a total of 16 observers in four different countries. It is good to see our program of international cooperation on Mars still making such

good progress well after opposition. The large refractor used by Mr. Curren is at the Chabot Observatory, Oakland, Calif. Hare, Ebisawa, and O'Toole have sometimes drawn the planet in its natural colors-such sketches are very attractive. We are very much indebted to Mr. Tsuneo Saheki, Mars Director of the Oriental Astronomical Association, for his kindness in copying for us fully 100 drawings of Mars that he secured from October, 1949, to April, 1950.

On June 15 the angular diameter of the planet will be 8".8. The north pole will be tipped toward the earth by 25 degrees, almost as much as possible. Quantity ⊙ will be 133°; the season on Mars will thus be about midway between the summer solstice and the autumnal equinox of the northern hemisphere. Although detail will naturally be more and more difficult to see as the planet recedes, we hope that A.L.P.O. members, especially those able to employ fairly large telescopes, will follow it for as long as possible.

All observers agree that the north polar cap was small and brilliant from the middle of March to the middle of May. The color of the cap was close to white, and it was seen well with all color filters that were used. However, Haas sometimes noted in addition either a yellowish or a bluish cast (not both at once); and German observers in February and March usually stated the color as white to bluish white. Saheki found the cap sometimes white, sometimes slightly yellow. The white probably comes from the cap on the surface of the planet; the yellow or blue, from clouds above it. Several observers found that the north cap was variable in brilliance and was sometimes sharply bounded, sometimes diffusely outlined. There was frequently seen around the brilliant cap, perhaps more often in February and early March than in April and May, a larger, duller, diffuse, and variable bright area; we can scarcely doubt that it was an atmospheric feature. This "vapor-hood" was yellow-white in color, definitely more yellow than the cap it surrounded. This cloud-cap around the surface cap is shown on Fig. 3 on pg. 1 of the April issue. Different observers disagree badly on the appearance of the dark north polar band bordering the north cap. It appears clear, though, that this band grew steadily fainter and less conspicuous during March, April, and May. Perhaps some observers were deceived by a spurious contrast-caused dark border to the brilliant cap; perhaps in some longitudes the visibility of the band was augmented by the presence of far northern surface features. This "melt-band" was extremely dark to O'Toole on March 23 at C.M. 117° and to Bevis on March 29 at C.M. 78° and on April 13 at C.M. 303°. However, in April, and to a still greater degree in May, a number of skillful observers in good views saw it either very faintly or not at all. This band looked bluish to Bartlett on April 4 and to Ebisawa in a 13-inch reflector on April 28 and May 15, though very faint to reveal color by the last-named date. On March 31 and April 7 Reese alone saw a round, blackish spot, which indented the north cap, on the north polar band near longitude 47°. On the same dates he perceived a prominent bright rift between the north base of Mare Acidalium and the polar band. Something of this rift was seen by the three Japanese observers, most plainly by Saheki, between April 8 and April 14. Using the McDonald Observatory reflector at 30 inches of aperture, C. W. Tombaugh on April 8 at C.M. 320° distinguished a gray rift in the north cap. Probably the same rift was observed by Hare on April 7 and 12 and appeared to him to be a continuation of Iaxartes canal. Otherwise, reports of rifts in the cap between mid-March and mid-May are lacking. "Detached snowfields" were also rare. On March 26 Meyer drew such an isolated bright spot near longitude 50°, latitude 80° N. On April 13 Bevis in a good view depicted a tiny spot of this kind near longitude 240°,

latitude 80° N. It is very interesting that he saw a rather conspicuous dark "melt-band" around the detached spot, just as around the north cap itself. A diffuse bright spot close to the north cap near longitude 250° was seen too often from March to May to be a shrinking snow-field and must instead be a persistent cloud. The same explanation probably applies to several other small diffuse areas in high northern latitudes recorded by Saheki. On several occasions the north cap was suspected of projecting slightly off the edge of the disc, but it may easily be that irradiation from the brilliant cap caused this appearance.

We now give recently received measures of the angular diameter of the north cap. By measuring his original drawings for the 1949-50 apparition, Ebisawa has found these values: October-November 38° (2 drawings), December 30° (2 drawings), January 28° (2 drawings), February 24° (3 drawings), March 3-14 14° (3 drawings), March 20-29 10° (4 drawings), April 9° (15 drawings), May 1-9 7° (6 drawings), and May 14-24 4° (8 drawings). Ebisawa found evidence that the rate of melting was greatly increased near February 20 when a giant group of sunspots was visible. (Saheki is convinced from long studies that there is a close relation between sunspots and the melting of the polar caps.) Saheki has obtained these values: September 53°, October 45°, November 36°, December 31°, January 25°, February 17°, March 11°, and April 9°. From March 25 to April 17 Haas obtained an average value of 17° from 12 drawings and a probably more accurate value of 12° from 6 estimates at the telescope. From April 21 to May 19 he secured average values of 14° from 11 drawings and 12° from 6 estimates. Estimates by Hare gave 10° on March 21 and 14° on April 2, 7, and 12. Johnson secured by measuring drawings 10° from March 16 to April 17 (6 drawings) and 11° from April 29 to May 26 (10 drawings). O'Toole measured his drawings to obtain 17° in March (3 drawings) and 11° in April (6 drawings). These numbers refer to the surface cap; he measured the larger "vapor hood" to be 33° on April 16, 21° on April 18, and 20° on April 24. Reese found these values from his 1949-50 drawings: 46° in September-October (3 drawings), 31° in December-January (3 drawings), and 10° in March-April. Murayama measured the diameter on a drawing to be 10° on March 4, and Cave estimated it to be 6° on March 29.

Probably greatest value should attach to a measure made by the editor of the diameter of the north cap on a Lowell Observatory photographic print. This print was given to T. R. Cave, Jr., when he recently visited the observatory. The photograph was taken on March 30, 1950, in yellow light with the 24-inch refractor. The diameter found was 13°, no correction having been made for the tilt of the axis of Mars.

A couple of puzzles have arisen about the melting of the north cap. A number of German and American observers looked in vain for any decrease in size before about the middle of December, 1949. Saheki's measures, however, indicate melting in progress already in September, 1949, only a few weeks after the vernal equinox of the northern hemisphere. Such pre-December melting is confirmed by the measures of Reese and Ebisawa, perhaps also by ones by O'Toole and Murayama. The second puzzle concerns the current size of the cap. The work of several American observers would indicate that the north cap reached a minimum diameter of about 10° near the middle of March and maintained that size at least until late May. Nevertheless, Saheki and Ebisawa found continuing shrinkage during April and May; and near May 22 they were both imputing to the cap a diameter of only about 3°. Needless to say, so minute a cap severly strains the powers of ordinary telescopes! They thought that the cap might disappear completely about the first of June.

The south cap was still rapidly and greatly variable in size and brightness; this behavior and its general appearance leave little doubt that it was still a purely atmospheric feature. Writing on April 6, Saheki predicted that a surface cap would begin to form about the middle of May, thus near ☉ 118°. Haas often found the south cap to be brighter with a red filter than with green and blue filters, presumably meaning that it was a yellow cloud; and O'Toole called the cap sometimes white, sometimes yellow-white. On April 30 at 3^h 22^m U.T., Haas found the south cap brightest with a blue filter, presumably meaning that it was composed of condensations of Type I; by 5^h 30^m it was no longer brightest in blue. Using no filters, Saheki remarked both bluish white and yellowish white brightenings near the south limb; these were often dull and diffuse. To Reese and Bartlett the south cap looked white. To Ebisawa the south polar regions were either white or bluish white. O'Toole, Johnson, and Bartlett occasionally suspected the south cap of projecting off the edge of the disc, and Saheki depicted a number of cloud-bulges on the south limb. Johnson in March-May measured the average diameter of the south cap on 7 of his drawings to be 30°. O'Toole in April found an average diameter of 56° from 6 drawings, the diffuseness of the cap probably accounting for some of this large discrepancy. Its bounds were too difficult to fix.

Both blue clouds and yellow clouds have been abundant in recent months. The observers agree very well that conspicuous bright clouds were often seen in low latitudes at both the east and west edges of the disc. These clouds, as well as some located elsewhere, have sometimes been even more brilliant and conspicuous than the north polar cap. At least one observer, in fact, wondered whether he had misplaced the north cap by 90°! Haas regularly found the near-equatorial limb and terminator clouds to be much brightened with a blue filter and hence regards them as of Type I. Johnson often confirmed with filters Haas' results here; and Cragg, Bellot, Cave, and Murayama did so occasionally. Without a filter these blue clouds look white, or nearly so. Yellow or yellow-white clouds, usually on the limb or the terminator, were recorded by Reese, O'Toole, Bartlett, and Saheki. From April 9 to 16 O'Toole found a large bright area just east (right in simply inverted view) of Syrtis Major to be yellow; enclosed within it were one or two white spots. L. T. Johnson saw an interesting appearance on March 31 at 2^h 50^m, or at C.M. 4°. Syrtis Major was nearing the west limb and was flanked by a blue cloud on each side; perhaps in reality Syrtis was seen through a single cloud. By 3^h 15^m the two clouds had blended into one. On April 1 at C.M. 4° Johnson again saw this pair of clouds, and on April 3 at C.M. 328° he remarked the one west of Syrtis. There are at least two other observations of the flanking of a surface feature by clouds. Saheki writes of regularly finding morning and evening mists near the "marshes" of Syrtis Major, Mare Acidalium, the Propontii, and Trivium Charontis. One may wonder whether there is enough water on Mars to permit marshes, but it is true that other observers have frequently seen bright clouds near Acidalium and Syrtis Major. Saheki on March 27 at C. M. 193° noticed a group of small, close-packed, and brilliant spots on the sunrise limb near the equator. An apparently similar observation was made by T. Cragg on February 8, 1948 with a 12-inch refractor. At C.M. 36° he distinguished a swarm of minute bright dots not far from the sunrise limb in equatorial latitudes. He saw them best with a blue filter.

Literally dozens of small cloud-projections on the limb or the terminator were recorded by A.L.P.O. members in March and April. Many of these objects are probably nothing but illusions, false effects caused by the irradiating of bright areas at the edge of the disc. Nevertheless, the very experienced

T. Saheki observed more projections than anyone else; and D. O'Toole also recorded a surprising number of them. We can take space to describe only a few projections. On various March and April dates Hellas (or sometimes Ausonia?) appeared to project to Saheki, O'Toole, Murayama, and Ebisawa. This behavior and its appearance in views with color filters suggest that Hellas was covered by clouds of Type I. On April 1 at C.M. 4° Johnson found that the blue cloud west of Syrtis Major (mentioned above) caused a "barely perceptible bulge" on the sunset limb. Johnson had not found it to project on March 31 at the same C.M. and with slightly better seeing. On April 4 Bartlett noted a distinct projection on the sunset limb near latitude 10° S., longitude 226°. This cloud was conspicuous and was yellowish, the color being confirmed with filters. On April 29 Haas suspected a minute projection on the sunrise terminator near latitude 15° N. from $6^h\ 20^m$ to $6^h\ 45^m$, C.M. = 159° to 165°. On April 30 he observed a very slight projecting of a cloud at the same latitude from $6^h\ 7^m$ to $6^h\ 13^m$, C.M. = 147°. On both dates he found with filters that the cloud involved was a blue cloud. If the two observations refer to the same object, then it moved due west (direction of decreasing longitude) over the surface of the planet at an approximate average velocity of 22miles per hour. On March 28 at $5^h\ 50^m$ O'Toole remarked a white cloud-projection on the sunset limb near latitude 10° N., longitude 344°. Perhaps this projection was short-lived, for on March 29 five observers noticed no projecting when it should have been on the limb again; however, Cragg and Haas did remark a large, brilliant, blue cloud with center near latitude 40° N., longitude 340°. Was it the same object? It appears significant that there were more cloud-projections on the sunset edge of the disc than on the sunrise edge. It should be remembered here that after opposition lower clouds could cause observable bulges on the sunrise terminator than on the sunset limb.