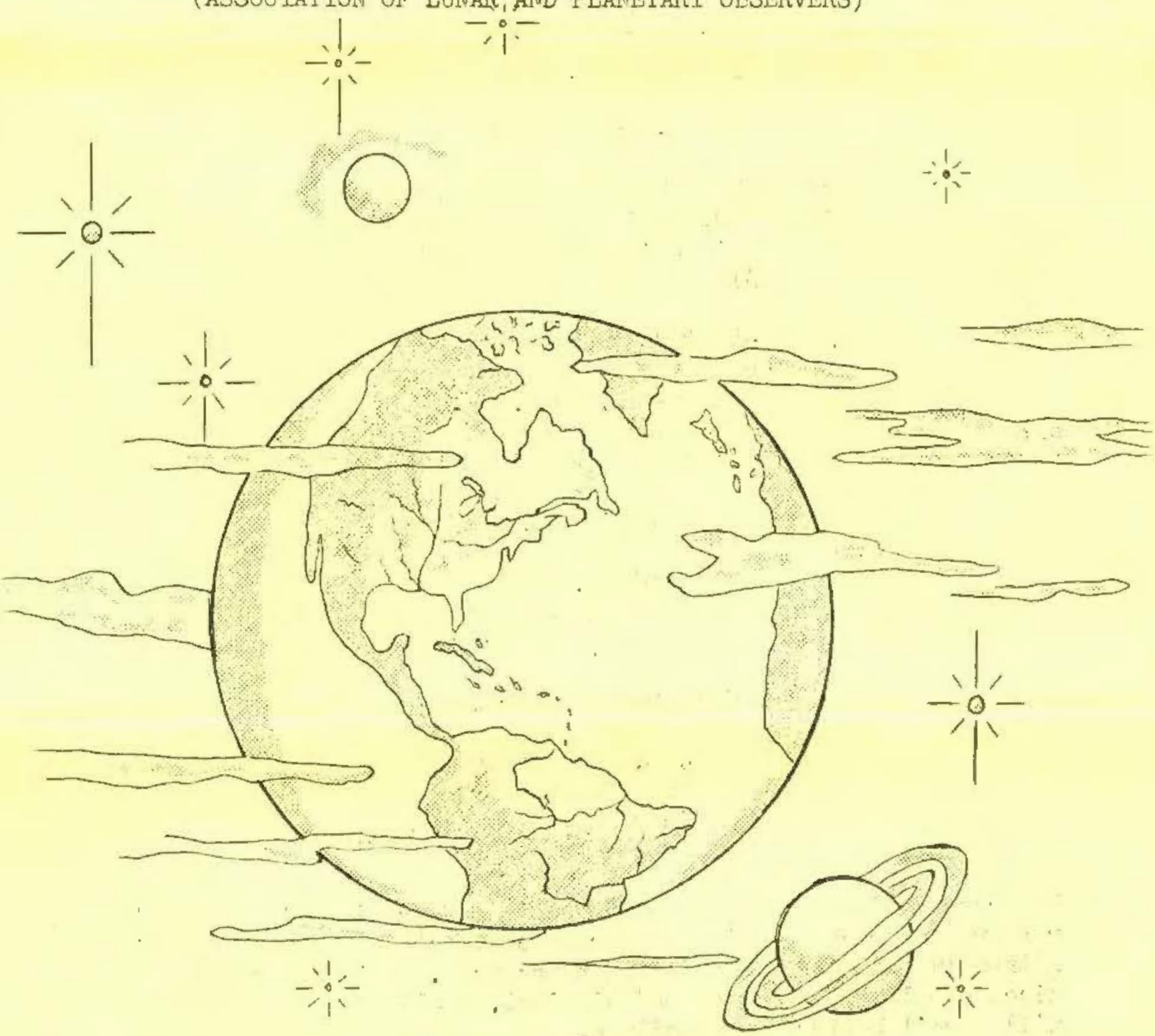
Volume 4, Number 3 March 1, 1950

THE STROLLING ASTRONOMER

(ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS)



Mailing Address

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

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

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

S T A F F

-Editor-

Walter H. Haas, Instructor in Mathematics
Astronomer, Institute of Meteoritics
University of New Mexico
Albuquerque, New Mexico

-Counsellor-

Dr. Lincoln LaPaz, Head of Mathematic Department
Director, Institute of Meteoritics
University of New Mexico
Albuquerque, New Mexico

-Acting Venus Recorder-

Thomas R. Cave, Jr.
265 Roswell Avenue
Long Beach 3, California

-Acting Jupiter Recorder-

Edwin E. Hare
1621 Payne Avenue
Owensboro, Kentucky

-Acting Mercury Recorder-

C. B. Stephenson
Yerkes Observatory
Williams Bay, Wisconsin

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.

(All dates and times by Universal Time)

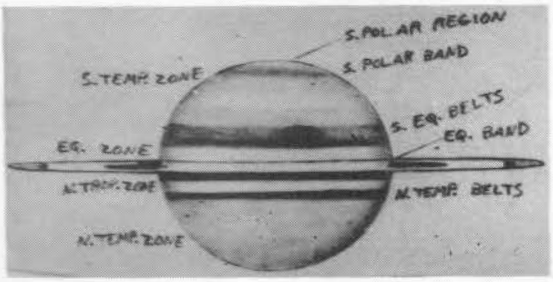


Fig. 1. Saturn. E. J. Reese
6-inch refl. 240X
December 16, 1949. $10^h\ 5^m$

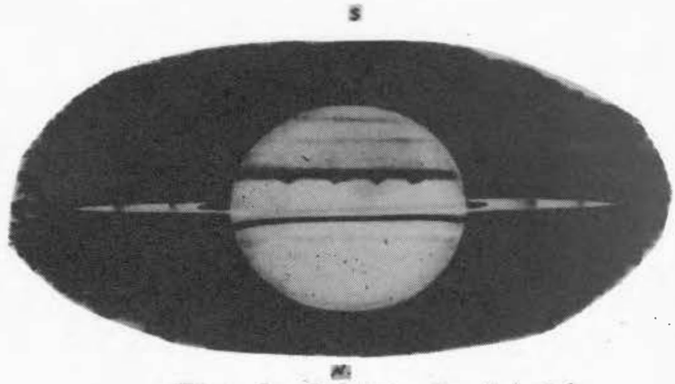


Fig. 2. Saturn. T. Saheki
8-inch refl. 400X
December 25, 1949. $20^h\ 10^m$

Fig. 3. Mars
E. E. Hare. 12-in. refl.
375X, 525X
Jan. 20, 1950. $10^h\ 50^m$.
C.M. = 29°

Fig. 4. Mars
T. Saheki. 8-in. refl.
400X, 500X
Jan. 15, 1950. $19^h\ 30^m$.
C.M. = 202°

Fig. 5. Mars
T. Saheki. 8-in. refl.
500X
Dec. 8, 1949. $20^h\ 5^m$.
C.M. = 212°

Fig. 6 Mars.
L. T. Johnson. 10-in. refl.
526X
Dec. 17, 1949. $10^h\ 45^m$.
C.M. = 349°

Fig. 7. Mars
T. R. Cave. 8-in. refl.
320X to 550X
Jan. 15, 1950. $11^h\ 22^m$.
C.M. = 83°

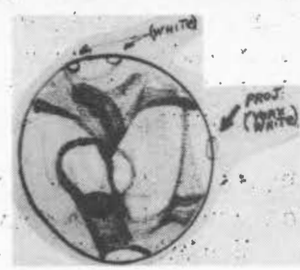


Fig. 8. Mars
T. R. Cave. 8-in. refl.
320X to 550X
Jan. 28, 1950. $9^h\ 52^m$.
C.M. = 300°

THE CRATERS ON THE MOON

by Lincoln La Paz

(Concluded from February Issue)

(The following article was originally published in Scientific American for October, 1949 and is reproduced here with the permission of the editors of Scientific American.)

In 1940 William Scott, one of the writer's students at Ohio State University, applied the probability theory outlined above to a group of 3,112 typical lunar craters, comprising all craters for which satisfactory position data are given in M. A. Blagg's compendious work, Lunar Formations. The results obtained by Scott show that it is extremely unlikely that the observed distribution of the more than 3,000 lunar craters considered is the result of chance. On the other hand, the distribution of a special class of lunar craters, the so-called ray craters, conforms rather closely to the theoretical random distribution for this class.

We preface our development of objection No. 2 by recalling several facts once familiar to all selenographers, but apparently lost sight of by many in modern times. It has long been known that most of the large craters on the moon have a polygonal rather than a circular form; where several neighboring craters exhibit hexagonal form, it is evident that at the time of origin of these craters, several regularly spaced centers of lateral pressure were in action simultaneously in the outer shell of the moon. Such a dynamical situation is quite inexplicable under Baldwin's meteoritic hypothesis, but is a necessary consequence of a new convection-current theory of the lunar craters.

The French astronomer P. Puiseux, from his exhaustive study of polygonal forms on the moon, was led to the discovery of a rhomboidal network of dikes and rills on the lunar surface, the lines of this network often almost coinciding with one or more of the edges of craters or ring plains of hexagonal shape. Occasionally he found a hexagonal crater which exactly filled out a mesh of his rill system. From a careful examination of the interrelations between the rill net and the craters, Puiseux came to the conclusion that the net constituted a primary, and the hexagonal craters a secondary, feature of the lunar surface. The meteoritic impact theory of Baldwin gives an explanation of neither the primary nor the secondary selenographic features discovered by Puiseux. However, the convection-current theory of the lunar craters recently developed by the distinguished astrophysicist J. Wasiutynski actually predicts the formation on the lunar surface of both Puiseux's network and the lunar craters.

Basic to the new theory is the work of H. Bénard and Lord Rayleigh on convection currents in gravitationally unstable layers of fluid heated on the under side. Wasiutynski applied the convection-current theory to a stratum of liquid basalt below the outermost shell of the moon. This explains first the formation of the "seas" or maria (large exposures of basaltic rock more or less completely cleared of light overlying granitic material by convection currents), second the development of the rill systems of Puiseux and third the formation of closed mountain chains and craters conforming to the Puiseux net.

Not to be outdone by proponents of the volcanic and meteoritic theories who point with conviction to terrestrial examples of craters originating by the favored process, Wasiutynski has set forth in most convincing detail the close analogy between certain terrestrial features--the stone and fissure polygons of the subpolar regions--and the lunar craters. The striking success of the convection-current theory in simply explaining the remarkable fields of roughly hexagonal stone and fissure polygons on the island of Spitzbergen, for which dozens of involved explanations have been offered in the last half-century, cannot fail to impress the reader. Wasiutynski even seeks to explain the lunar ray craters solely on the basis of convection currents, but here, in the writer's opinion, too much is at last expected of the convection theory. On the one hand, this theory would not predict a random distribution of the ray craters on the moon; and, on the other, Wasiutynski's explanation of how ray systems can develop on the maria is in contradiction to his earlier explanation of why rills on the maria, where there was no granite at the top, were almost completely obliterated by the inflow of liquid basic magma from the basalt layer. The discrepancies just alluded to and the highly significant fact that the great majority of the ray craters are situated on the maria (i.e., on those undisturbed areas of the moon continuously exposed for the longest time to meteoritic impact) give support to the writer's belief that the lunar ray craters are meteorite craters.

ANNOUNCEMENTS

We are very sorry to report that circumstances beyond his control have made it impossible for Mr. Elmer J. Reese to continue to be Acting Jupiter Recorder. His work in this position has been of the highest quality and was a service of real value to the A. L. P. O. We are fortunate in having been able to find as the new Acting Jupiter Recorder a skillful observer whose name is already familiar to our readers, Mr. Edwin E. Hare, 1621 Payne Ave., Owensboro, Kentucky. All observations of Jupiter in 1950 should be submitted to Mr. Hare. Any observations of Jupiter in 1949 not yet reported should go to Mr. Reese, who is kindly undertaking to work up the data on that interesting apparition.

This year's National Convention of the Astronomical League will be held at Wellesley College, Massachusetts, on July 1, 2, 3, and 4. Some details are furnished on pg. 87 of the February, 1950 Sky and Telescope; and additional information will be supplied by that magazine during the next few months. We hope that a substantial number of our readers will plan to attend; accommodations will be furnished on the campus at reasonable rates. It is planned to emphasize instruction in observing at this Convention; and at the League's kind invitation, the A. L. P. O. will report on several phases of its observational activities.

On the other coast the Second Convention of Western Amateur Astronomers will meet at Palo Alto, California, on August 14, 15, and 16. A visit to the Lick Observatory is planned for the evening of the last day. The Peninsula Astronomical Society are the hosts at Palo Alto; and the Chairman of their Convention Committee is Mr. H. A. Wallace, 2925 A Jackson St., San Francisco 15, California. Write him and have your name placed on the mailing list in order to receive future releases of information about this Convention.

REPORT ON VENUS

by T. R. Cave, Jr.

This month we shall continue the discussion of recent work on Venus by the observers listed last month.

The Cusp-Caps. The north and south cusp-caps, so prominent prior to dichotomy, both became increasingly more difficult during the period from late November to early January. Mr. E. J. Reese strongly suspected the north cusp to be brighter than the south cusp on Nov. 9 "(Universal Time here and later)." Mr. Haas found on Nov. 12 that both caps were visible but very small, and Cave found much the same condition to exist on Nov. 21. Messrs. E. K. White and S. C. Venter both noted the cusps to protrude into the dark hemisphere rather noticeably on Nov. 20. Mr. W. H. Haas thought both caps rather oval in appearance but of the same size on Nov. 25. During the first few days in December Mr. T. A. Cragg felt that the cusp-caps were both unusually small and faint, as though obscured by the Venusian atmosphere more than is normal. Mr. S. Murayama at Tokyo, Japan, found on Dec. 2 that the north cap was the larger; but neither of the two caps appeared distinct then. On Dec. 6, however, Murayama noted the south cap to be quite distinct. Mr. L. T. Johnson strongly suspected the south cusp to extend beyond the normal concave terminator, and it appeared even more pronounced to him on Dec. 7 than on previous occasions. Mr. LeVaux found on several occasions after Dec. 11 that each cusp-cap was somewhat variable and hazy in appearance. Miss H. Koyama, observing at Tokyo with the same instrument used by Mr. Murayama (an excellent 8" Zeiss refractor), noted in three observations from Dec. 6 to Dec. 23 that the north cap was conspicuous and that the south cap appeared always very small. Miss Koyama made a very remarkable observation on Dec. 23 at 5^h 40^m U. T., using 180X on the 8" "refr."; a very small and intensely bright spot was seen near the tip of the north cusp-cap. On Dec. 28 Mr. E. E. Hare, using his newly completed 12" long focus reflector of excellent quality, found an almost even blending of the cusp-caps with the narrow bright limb-band. On this same date Mr. D. O'Toole noted both cusps to be equal, and on Dec. 31 he found that the south cap was bordered by a narrow but dark cusp-band.

The White and Dusky Areas. As the apparent diameter of Venus rapidly increased and the phase grew more crescentic, these white and dusky markings so often reported in the past increased in ease of visibility, perhaps due as much to contrast-effects as to the larger apparent diameter of the disc. The mottled appearance of the disc seen as early as late September by Reese and subsequently by several others became very much more pronounced. Several observers found these two types of markings more steady in visibility and not so likely to change in general appearance during an observation. Murayama and Koyama, using the largest refractor in general use during this period, thought the dusky markings prominent. O'Toole and Chorley have on several occasions agreed well upon the positions and appearance of both light and dusky markings visible upon the disc. In December Haas normally found that the southern hemisphere was predominant in dusky details; and his numerous observations are very well confirmed by Murayama, Koyama, Johnson, Cragg, Bartlett, Brinckman, Cave, and several others.

Visibility of the Dark Hemisphere. In the last two reports the Recorder has devoted considerable space to this curious phenomenon. Dr. Bartlett has thrown some possible new light on this interesting occurrence. He believes that the unilluminated hemisphere is in reality not nearly such a difficult object to see as has normally been supposed. Dr. Bartlett in his letter of Feb. 12 to the

Recorder gives what may well at least in part explain the conflicting views of "darker than" and "lighter than" appearances of the dark hemisphere relative to the sky-background. He writes in part: "If you will observe the new moon in the summer, when the thin crescent is seen against a bright western sky, you will notice that the dark hemisphere always seems darker than the sky, and if you will compare the color of the sky to that of the earthlit part of the moon you will notice a marked difference in chroma. For this reason the dark side makes a negative contrast with the lighter sky background and so seems materially darker. Observe the same moon in winter, against a dark sky, and it will seem brighter. In the one case color is more apparent than illumination; in the other illumination is positive to color. Hence the earthlit hemisphere may seem darker or lighter than its sky background according to which factor predominates". Mr. Arthur W. Orton of San Bruno, Calif. and Mr. Lyle T. Johnson of La Plata, Maryland have given other explanations, which the Recorder will discuss in the next report.

Haas' Mid-Terminator Cloud Bulge. Mr. W. H. Haas observed a terminator bulge on Dec. 23-24, first seeing it at $23^h 37^m$ U. T. During the next twenty minutes he noted that the bulge seemingly became noticeably more prominent, and at $23^h 53^m$ he estimated it to project beyond the true terminator by 0".5. On several dates after this initial observation Haas was able to recover what very apparently was this same bulge, sometimes appearing more difficult and at other times more prominent than when first "discovered". To quote directly from Mr. Haas' analysis: "Measures of original drawings give for the bulge near the middle of the terminator these values:

Date	'Lat.' S. end bulge	'Lat.' N. end bulge	'Height' of bulge
1949, Dec. 26 (U.T.)	2° N	13° N	0".5
Dec. 31	3° N	19° N	0 .7

('Latitude' is computed on the assumption that the phase-cusps of the planet and the geographic poles coincide.) The notes on Dec. 23 will give, perhaps with less accuracy, that the cloud had a 'height' (or breadth perpendicular to terminator) of 0".6 and that its center lay at latitude 9° N. In the paper by H. M. Johnson and W. H. Haas called 'Observations of Venus, 1938-42, and Their Interpretation', published in J.R.A.S.C. in 1943, there is developed this formula for computing the height of a cloud-projection on the terminator:

$$H = \frac{7700\ W^2}{D^2 \cos^2 L}.$$

Here H is the height of the cloud above the 'surface' of Venus in miles, D is the angular diameter of Venus in seconds, W is the angular 'height' of the projection in seconds, and L is the acute angle between radii of Venus drawn toward the cloud and toward the earth. For the present bulge we have W = 0".6. Quantity D varied while the bulge was being followed from Dec. 23 to Dec. 31, but 42" might be a usable average value. If we take i (which also varied) to be 120° and the 'latitude' to be 9° N., then L comes out as 31°. One can then use the formula to compute that the height H was 2.1 miles or about 11,000 feet."

Remarks by the Recorder - The Recorder wishes to congratulate all the observers who have submitted work, reviews of which were of necessity much too incomplete in this report and the preceding one. Dr. Bartlett just sent the Recorder a most beautiful color-drawing of Venus on Jan. 8 at 22^h 55^m U.T.; it illustrates colors of the dark hemisphere better than the Recorder has seen in other drawings before. It is hoped that all observations made during the period of inferior conjunction will be in the Recorder's hands no later than March 10. They will be the main topic for the next report.

Postscript by Editor. We learn from Mr. C. B. Stehpenson that Dr. Meinel of the Lick Observatory has succeeded in photographing the interior of the very narrow crescent of Venus as darker than the sky. He took the photograph in ultraviolet light when Venus was near inferior conjunction in June, 1940, using a 6-inch reflector. Dr. Meinel is of the opinion that the effect is actual and is caused by the silhouetting of the planet against a brighter background. The possibility still exists, of course, that sometimes the dark hemisphere is brighter than the sky because of Venusian atmospheric emission.

OBSERVATIONS OF MERCURY FROM OCTOBER, 1949 TO JANUARY, 1950

by C. B. Stephenson

All times and dates are given by U. T. Nomenclature used for the surface markings is that of E. M. Antoniadi. The quantity i is the phase angle, i.e. the angle sun-Mercury-earth; and k is the illuminated fraction of the planet's disc.

Mercury was observed during its October, 1949 morning apparition by D. O'Toole and W. H. Haas in Vallejo, California and Albuquerque, New Mexico, respectively, each using a 6" reflector. Haas made two drawings under poor conditions, estimating relative intensities of the various portions of the planet's visible surface on a scale of 1 (darkest marks) to 5 (brightest marks). On Oct. 14 at $i=119^\circ$, $k=0.31$ he drew five narrow, arc-like dark markings on the crescentic disc and found the regions of the cusps to exceed the general surface slightly in brightness. A broad, bright limb band running from the south cusp for about 100° along the limb was drawn; this band was thought to be still brighter than the cusp caps. No terminator band was drawn. On Oct. 19 at $i=84^\circ$ Haas again drew five sharp dark markings, not in each case identifiable with those drawn on the 14th, which are definitely identifiable only in the cases of S. Lycaonis-Horarum Vallis and S. Promethei. A limb band narrower than the band drawn on the 14th was recorded on the 19th with the same relative brightness and position on the limb. The regions of the cusps scarcely differed at all from the brightness of the general surface; and the terminator was seen quite convex, without any general darkening. O'Toole, observing at the same time from another location, on the 19th considered the terminator possibly convex. On Oct. 22 at 14^h 10^m and $i=69^\circ$ O'Toole had a very good view, finding the terminator convex and noting a conspicuous protruding north cusp cap which remained continuously visible throughout considerable variations in the seeing. The region of the terminator was dark; and an isolated dark marking was seen, which may have been a portion of Horarum Vallis. He remarks of this feature that in the poorer seeing it was seen as "a very intense dark streak. When the seeing sharpened up at several moments, the dark patch appeared to be wider and much less dark than in the poorer seeing." O'Toole succeeded in observing the planet at $i=41^\circ$ on Oct. 30 but was unable to do more than determine that the terminator was convex.

During its evening apparition of December, 1949 and January, 1950 Mercury was observed by H. Le Vaux and Thomas Cragg, both of Los Angeles, California and each using a 6" reflector. Le Vaux observed and made drawings on December 28, 30, 31, and January 4; and Cragg did so on December 28, 29, 31, January 4, 5, and 6. They observed together on Dec. 28 but independently on all other dates and in all cases near 1^h or $1^h 30^m$.

On Dec. 28 at i=59° both saw two dark markings running away from the terminator; these probably were S. Criophori and, possibly, S. Alarum. The same general detail was subsequently drawn again and again by both observers; Cragg later saw in addition a large amount of other detail, both associated with and isolated from the terminator. Many of his dark markings indeed were seen very near or on the limb. Represented altogether by Cragg are apparently Criophori (all six drawings), Aphrodites (four drawings) and Persephones (three or four drawings), probably Atlantis, and possibly Maiae. Le Vaux found both cusps bright on Dec. 30 and 31; Cragg found the north cusp bright on Dec. 29 and both cusps bright on Dec. 31, Jan. 4, 5, and 6. Both observers made the size and shape of the bright cusp regions variable; and Cragg in addition drew a number of bright spots on the limb, one and the same spot on the northwest limb probably being depicted on four drawings. Neither observer drew a terminator band; and both made the terminator convex on Dec. 31 at i=73° and concave on Jan. 4 at i=92°, although Le Vaux was not certain on Jan. 4.

The available observations indicate that dichotomy occurred approximately at the predicted times in October and January, but a disturbing element is injected into the observations by Cragg's bright limb spots. These have been seen before; but in most cases one cannot say with complete confidence either that the spots existed or did not exist or whether they are permanent features of the Mercurian surface if they do exist or are only temporary ones, owing to the lack of simultaneous confirmatory or contradictory observations by other observers. The matter of simultaneous observations is of considerable importance; and the problem of temporary bright spots on Mercury, as well as the question of the variation in brightness of the cusp regions, is not likely to be resolved until a program of more intensive observation of the planet than has been done at any time in the past, with respect to the number of observers, is undertaken.

ABOUT THE MOON AND MARS

On pg. 9 of the December issue we mentioned a "hair-like bright line" seen against the moon by M. Williams on November 3, 1949. It was suggested that we might here have a moving lunar bright speck, of which more than 20 have now been seen by various members of the A.L.P.O. during the last 10 years. They have been interpreted as meteors luminous in a very rare lunar atmosphere. Mr. Williams, writing on December 25, points out that the speed of his object would have had to be much more than 100 miles per second if it were at the distance of the moon; and he hence wonders whether he may really have seen a terrestrial meteor against the moon. This possibility naturally exists for all moving bright specks seen against the moon; so far our arguments that many of them are outside the earth's atmosphere are wholly statistical. Planned duplicate surveys of the moon by different observers some distance apart and watching simultaneously are still badly needed. We are indebted to Mr. R. Rigollet and his colleagues in France for taking much interest in this problem of lunar meteors. It has been discussed in the February, 1950 issue of Mr. Rigollet's valuable Documentation des Observateurs and in a number of preceding issues. We recommend this periodical to all our members able to read French.

A drawing of the famous crater Tycho by H. P. Wilkins at 22^h on June 5, 1949 (U. T. here and later) shows a cleft to the west of the central mountain. At 3^h on December 30 E. J. Reese was able to confirm this cleft by glimpses and found it darker in its northern part than in its southern part. Reese easily saw the small hill a little northwest of the central mountain of Tycho and was very surprised that past observers should have considered it a difficult object. There is evidently much still to be done on the topography of the less obvious lunar features. American lunar students have tended to neglect this phase of their subject. Those interested in it cannot do better than to cooperate with the world-wide Lunar Section of the British Astronomical Association. Their Lunar Director is Mr. H. P. Wilkins, 35 Fairlawn Avenue, Bexleyheath, Kent, England.

T. Cragg made six drawings of the crater Atlas from September 27 to November 4. Of the two main dark areas on the floor the southern one was fairly constant in appearance from early morning to early afternoon lighting; but the northwestern one grew progressively more prominent during this interval, and darker areas in it apparently varied in position. While the lighting was low enough, many tiny hills on the floor and "clefts" (terraces?) in the south and west walls were seen. A darkening of the southeast part of the floor present under low morning lighting faded out as the sun became higher for Atlas.

Such observers in the A.L.P.O. as Reese, White, Cave, Hare, and Haas have clearly seen within the Linné white area a small crater. This crater is excellently shown in drawings reproduced on Plate XXXVI in Fascicule II of <u>Observations des Surfaces Planétaires</u>, having been clearly seen at Mr. R. Jarry-Desloges' observatories in 1907 and 1909. The crater in question is very small, perhaps only a mile or two in diameter; and it is quite out of the question, in the editor's opinion, to suppose that it is the controversial and fairly conspicuous object described by Schmidt and others prior to 1850. It is invisible in modern instruments of mediocre quality, even when they show more detail than pre-1850 instruments disclosed. The crater is very deep, for crescent-shaped shadow has been seen in it with Linné fully four and one-half days from the terminator. On October 31, 1949, D. O'Toole with a 6-inch reflector saw this crater and its internal shadow; the crater's diameter was about one-fourth that of the white area, in good accord with the estimates of other observers. Linné was about three days from the terminator on October 31. When it was very close to the terminator at 3^h 30^m on November 27, 1949, O'Toole in excellent seeing was surprised to find a peak casting a long shadow in the very position of the white area and its central craterlet, as indicated by an examination of about a dozen small craterlets and spots in Mare Serenitatis. On December 27 he saw this peak again. What is the relation of this peak to the craterlet? On pg. 106 of his <u>Moon</u> Goodacre mentions a small peak observed on the western edge of the white area by Schmidt, Molesworth, and others and also several other peaks or hills in the immediate vicinity. Probably only low illumination views showing the peak, the white area, and the crater can solve the puzzle.

The floor of Plato continues to interest several observers. In a good view last October 10, about two days after noon on Plato, Reese found this order of decreasing conspicuousness of the floor spots: near-central craterlet, southeast craterlet, northeastern of twin craterlets, southwestern of the twins, small spot about one-fourth of the way from the central craterlet to the south wall, east central white area, "new" spot about two-thirds of the way from the central craterlet to the southeast craterlet. Using his 12-inch reflector on December 31 with Plato about two and a half days from the sunrise terminator, Hare was able to see crescentic shadows and bright east inner walls in all seven objects just listed, thus showing that all seven are craterlets. The "new" craterlet first seen by Reese on September 10, 1949 (pg. 8 of November issue) has now been confirmed by Hare (7-inch reflector, 12-inch reflector) and O'Toole (6-inch reflector). It may be far from "new", for it appears to be clearly shown as craterlet 11 on Molesworth's 1896-7 map of Plato (pg. 243 of Goodacre's Moon). On November 30 Reese and O'Toole independently observed Plato about two hours apart. It is encouraging that they each saw the same six craterlets (O'Toole recording two others with better conditions than Reese had) and that they are in some agreement on the order of conspicuousness of these objects. On this date Reese was puzzled to find the shadow in the near-central craterlet "dusky, not black" since he has seen this shadow under considerably higher lighting than prevailed on November 30. O'Toole saw this shadow in his view (two hours after Reese's and at $3^h 30^m$) but does not comment on its intensity. As for the twin craterlets in the north central part of the floor, Reese, White and Cave agree that in the autumn of 1949 the northeastern one was the larger and more conspicuous. Nevertheless, O'Toole thought the southwestern one definitely the larger on October 31 and November 30, the seeing being perfect at times on October 31. Cave suggests that this reversal of the relative sizes by O'Toole may be due to a peculiar kind of atmospheric conditions ("large slow moving filaments of striated air") and speaks of having found the same appearance himself "momentarily". The editor would have more confidence in this explanation if O'Toole had not had such good conditions.

Hare's view of a shadow-holding craterlet inside the east central white area in Plato is extremely suggestive of the Linné white area and its included craterlet. The late W. H. Pickering made a detailed study of changes in size of this Linné area with the varying solar lighting and also during lunar eclipses. It would appear desirable to subject the Plato area to similar investigations, and we recommend this project to all readers having access to telescopes with micrometers. Indeed, probably something can be done by merely comparing the size of the east central white area to that of other spots on the floor of Plato. Reese finds this white area sometimes bright and sharp, sometimes diffuse and indefinite.

D. O'Toole drew the walled plain Grimaldi at 5^h on November 4, 1949. The illumination being very low, he saw several peaks and a mound on the floor. A dark area that he drew near the east wall probably coincides with one seen at the same solar lighting by Haas on March 13, 1949 and mentioned on pg. 9 of our April, 1949 issue. The editor suspects that this dark area is produced by the roughness of the floor there combined with the oblique lighting.

The following notes about lunar colors were recorded by E. J. Reese with a 6-inch reflector at 60X at 4^h on November 9, 1949. The moon was then a few days past full. "The moon is certainly not colorless. The colors, though subtle, are quite evident after the eye becomes adjusted to the image. Most of the maria are pale blue-gray or steel-gray in color. Mare Tranquilitatis is especially blue. The interior of Mare Serenitatis is brownish-gray in contrast to its dark blue-gray border. The strongest and most distinct color on the moon is a rusty-brown hue spread in the form of light wisps, streaks, and diffuse patches over much of Mare Frigoris and the northern part of Mare Imbrium. Sinus Iridum also shares this reddish-brown hue. The lighter portions of Sinus Roris near the limb are a peculiar pale olive or greenish-gray color. The mottled area northeast of Aristarchus is of different color than surrounding regions-a cold, neutral hue. The rays from Copernicus seem to be whitish with a very slight yellowish tinge. For the most part, the bright areas on the moon are creamy-white."

In recent months Dr. James C. Bartlett has also written of his impressions of lunar colors. He has found in the region north of Aristarchus and between the horns of Schroeter's Valley a peculiar hue perhaps best described as "brownish olive"- some brown but more green. Haas has been able to confirm the brown component with the use of color filters. The adjacent Oceanus Procellarum shows a considerably different hue to Dr. Bartlett. It is a chalky gray under morning illumination, the chalkiness being attributed to an abundance of small white features. By noon and for a few days thereafter the whole Oceanus is a distinct slaty-blue gray, very different from Mare Imbrium which is a yellow-gray-green. Under low evening illumination, he continues, "the slaty tint [in Procellarum] gradually fades and is replaced by a very distinct brownish tone-which strongly resembles the brown hue of Sunday rotogravure sections." The whole crescent, in fact, shares to some extent in this brownish tone. By earthshine Dr. Bartlett has found that the bright highlands on the eastern limb "seem bathed in a very pale blue radiance." On the sunlit regions he has "frequently examined the surface of Mare Frigoris north of Plato because of the faint reddish-brown surface tint" there, and he suspects that this tint is variable.

We urge our readers to look for these lunar tints described by Reese and Bartlett. Even a small telescope, preferably a reflector, will suffice. Color filters of known transmissions may aid in revealing the colors indirectly or in confirming them (see Dr. Bartlett's discussion on pg. 3 of January issue). It would be of value in this connection to take photographs of the moon in different colors.

The planet Mars will reach opposition on March 23. The closest approach to the earth will occur four days later on March 27; the angular diameter will then be 14".40 and will exceed 12".9 all during March. The summer solstice of the northern hemisphere ($\odot = 90^{\circ}$) will fall on March 14. The north pole will be tipped toward the earth by 21 or 22 degrees throughout the month. During the last month observations of Mars have been received from F. E. Brinckman, Jr. (6-inch refl.), T. R. Cave, Jr. (8-inch refl.), T. Cragg (6-inch refl.), W. H. Haas (6-inch refl.), E. E. Hare (12-inch refl.), T. Howe ($1\frac{1}{2}$-inch refr.), L.T. Johnson (10-inch refl.), S. Murayama (6-inch refl.), D. O'Toole (6-inch refl.), and E. Pfannenschmidt (5-inch refl.). We hope that many more observers will share in these studies now that the planet is well placed before midnight.

Writing on January 12, 1950, Mr. Tsuneo Saheki of Osaka, Japan made a number of predictions of coming Martian events for this apparition. We list them here because we know that our readers will want to watch to see whether they are fulfilled or not. Mr. Saheki is Mars Director of the Oriental Astronomical Association and has been observing the planet since 1933.

1. There may be a seasonal doubling of the canals in August, 1950. Unfortunately, the planet will then be remote.

2. Mare Acidalium will show a dark pentagonal shape after May.

3. The north polar cap will be surrounded by a white and brilliant ring, perhaps a cloud, subsequent to February.

4. The north polar cap may vanish about July 10, but at that time thick and white cloud masses may deceive observers into thinking that a fresh snow cap has formed. If and when these cloud masses fade out, the bluish polar regions will be seen to be bare of snow.

5. Near this time the first snow or frost may form near latitude 75° north.

6. Careful attention should be given to Trivium Charontis and to a conspicuous "new" dark spot east of Nodus Alcyonius. The latter was discovered by Saheki in 1946 with the Tanakami Observatory 18-inch reflector, and it was observed again in 1948 by both him and Murayama.

On pg. 11 of our February issue we described Mr. Tsuneo Saheki's curious gray cloud-bulge on Mars near $19^h 30^m$ on January 15 (U.T.), and Figure 4 on pg. 1 of this issue shows the drawing that he made at the time. We learn from a more recent letter from Mr. Saheki that this cloud was observed by Messrs. S. Matsui and T. Mitani at $16^h 30^m$ on January 15 with the 12-inch refractor at the Kwasan Observatory of Kyoto University, Japan. This confirmation of the object is naturally important; with his (smaller) 8-inch reflector Saheki did not notice the cloud until $19^h 0^m$. Perhaps it was less conspicuous or was projecting less at $16^h 30^m$ than later. We may be able to give additional details about this gray cloud in a future issue. We unfortunately know nothing of the subsequent history of this cloud. Very poor weather prevailed in Europe in late January, where the affected portion of Mars could then be observed. On January 29 at C. M. 222° with rather poor conditions, to be sure, Pfannenschmidt suspected a slight projecting of an extremely bright yellowish-white south cap. There would apparently be some agreement in position, color, and height with Saheki's object; but Pfannenschmidt thought at the time that he was witnessing nothing more than an optical effect. Searches in this country in February showed no sign of the gray cloud. Dr. G. Kuiper at the McDonald Observatory saw no abnormal-looking Martian clouds with the 82-inch reflector. Haas could see only a rather plain south polar cap near the south limb in the critical longitudes; this cap he suspected of projecting slightly not far from C. M. 202° on February 4 and 6 (but not near this C. M. on February 2, 8, and 10). Is there here confirmation of Pfannenschmidt's suspected object? However, Haas was very uncertain of the reality of the projecting; and on February 4 no such appearance was seen by Johnson at C.M. 181° or by Hare at C. M. 210°. Of course, one would scarcely expect a Martian cloud composed of volcanic ash or anything else to remain visible for several weeks.

It will be remembered that Saheki estimated the cloud to be 900 miles in diameter and to have its center at longitude 202°, latitude 58° south. Haas decided to compute at what times portions of the cloud at longitude 202° and at various southern latitudes were on the (morning) limb of Mars, with these results: 53°, at $15^h 34^m$; 58°, at $16^h 7^m$; 63°, at $16^h 57^m$; 65°, at $17^h 29^m$; 67°, at $18^h 20^m$. Moreover, the estimated size of the cloud would demand that it required several hours to cross the limb at these latitudes. Since Saheki noticed no cloud-projection from $16^h 0^m$ to $17^h 30^m$, one may tentatively conclude that most of the cloud was far lower than the height of 60 miles that he estimated at $19^h 30^m$.

The north cap was almost always very brilliant in January and February, Howe calling it "dazzling white" with only a 1½-inch telescope. Johnson on February 12 did find this cap indistinct at C.M. 119°, and Haas on February 15 thought it less bright than usual at C. M. 171°; but these conditions must have been very temporary. Johnson on February 4 at C. M. 181° suspected a separate tiny white area to the east of the north cap, and Haas on February 15 at C.M. 171° glimpsed a gray rift in the cap. Such features have often been reported in the past during the spring melting. As for the size of the north cap, Murayama found an average angular diameter of 35° for November 29-December 11 (4 drawings) and one of 28° for January 25-27 (2 drawings). Brinckman secured 30° for January 23-28 (3 drawings). Cragg obtained by measures of drawings 29° on both January 17 and 31. Haas found 27° as the average of 10 drawings from January 31 to February 19. Probably most weight should be assigned to the work of Johnson and Hare, who employed the largest telescopes. Johnson obtained by measuring drawings these diameters: 26° on January 17, 22° on February 4, and 18° on February 12. Hare estimates the diameter of the north cap directly at the eyepiece by comparing its size to that of the whole disc of Mars. In this fashion he found a steady decrease from 23° on January 20 to 15° on February 17. Three observers have found a systematic difference between such estimates and measures of drawings. Two of them consider estimates more dependable than drawings (less affected by irradiation?). The north polar band surrounding the melting cap is gradually lightening, though some observers find it still darker than most other features.

The south cap was still rapidly variable in size and brightness during January and February, but on the whole it was more prominent than in the autumn of 1949. On January 31 at C.M. 263° Haas found the south cap "brilliant" and the brightest that he had yet seen it at this apparition. On February 19 at C.M. 63° he considered the south cap to be almost as bright as the north cap and fully as large (really larger, because of the tilt of the axis). A few views showed the south cap not diametrically opposite the north cap. Color filters indicated that the south cap was at times a yellow cloud. On January 28 at C.M. 300° Cave drew two small white spots on the south limb (Figure 8 on pg. 1).

Clouds are still common, especially on the limb and the (sunset) terminator in low latitudes (Figures 3 and 4). Studies with filters indicate that some of these are yellow clouds and others, blue clouds. On February 15 near C.M. 139° Haas examined a near-equatorial terminator white area which became fully as brilliant as the north cap in a blue-filter view. Probably the same cloud was seen by him on the terminator near latitude 25° south on February 18 near C.M. 150°. Undistinguished with a red filter, this cloud was apparently even brighter than the north cap with a blue filter. Cave on January 31 near 7^h 55^m recorded an extensive yellow-white cloud on the limb just following Syrtis Major. This cloud apparently dissipated rapidly with the progress of the Martian day, for near 9^h 20^m on the same date neither Cragg nor Haas observed any cloud in contact with Syrtis Major. Neither did this _mare_ look faint and obscured to them; indeed, Haas at 10^h 38^m called it "_very dark_ and prominent" in a hazy sky and found it "much less dark" the next day in a better view. Johnson on February 12 at C. M. 119° found detail extremely indistinct although the limb was sharply defined. Moreover, the color of the disc was then a nearly uniform yellowish-orange, apparently less red than usual. Color filters had little effect on the detail. Johnson suggests that violent dust storms were in progress on Mars at the time. On January 28 Cave drew a "very white" cloud-projection on the limb (Figure 8). Its approximate position would be longitude 30°, latitude 10° north. The cloud involved was probably rather difficult, for Brinckman did not see it while observing at the same time with a smaller telescope.

O'Toole and Haas have found the southern _maria_ rather dark and conspicuous, even though it is autumn in their hemisphere.

Aryn is darker than the rest of Sabaeus, being extremely dark to Haas on the terminator on February 19. Hare has divided the forks of Aryn with his 12-inch reflector. Mare Acidalium is very dark to all observers, and Hare and O'Toole have seen Achillis Pons as a narrow lane between Acidalium and Niliacus (Figure 3). On January 20, when ⊙ was 67°, Hare saw Acidalium completely detached from the north polar band (Figure 3), an effect he did not record in 1948 until ⊙ was 82° (smaller telescope, however). Moreover, Johnson saw this detachment in 1949-50 as early as ⊙52° (Figure 6). Hare on January 20 observed Argyre I as a small far southern area fully as brilliant as the north cap (Figure 3). On February 17 and 18 Hare observed Juventae Fons as a very dark dot and Baetis as a very dark and narrow canal. His success appears remarkable when one notes that the angular diameter of Mars was then only 11".8; Juventae and Baetis escaped most observers of Mars at the "favorable" 1941 apparition. On the same dates Hare saw the seldom mapped Achillis Fons as a darker spot on Nilokeras canal. Haas confirmed this oasis on February 25. A very inconspicuous Solis Lacus has been recorded by Hare and Cave (Figure 7). Near longitude 100° the detail is extremely faint and difficult for most observers. Propontis is now considerably less dark than Casius. On February 16 and 19 Haas found what was apparently Titan canal rather intense near the limb. Was it falsely strengthened by contrast with the bright limb? On January 29 Pfannenschmidt found Cerberus-Styx large and dark, as Saheki had on January 15 (Figure 4). Hare on February 4 and Cave on February 1 drew Elysium as a roughly pentagonal region enclosed by canals. A drawing by Cragg on January 31 appears to show Syrtis Minor extending much farther north than is normal. Trivium Charontis looked very dark and wedge-shaped to Cave on January 31 and February 1. Nepenthes canal remains rather conspicuous (Figure 8). Sinus Sabaeus was narrow and very dark to O'Toole on January 29 and 31. Other observers have very probably seen Sabaeus merged with Pandorae Fretum. In February Haas was unable to recover the white lane running northeast from Lunae Lacus that he had seen in January. He is hence inclined to think that this white lane and some other similar ones which he has glimpsed are transient features. On February 3 Hare saw Hellas as a bright area on the limb. In the same view he drew what may well be an intense Nodus Alcyonius and a similar-looking dark spot just to its east-perhaps Saheki's object mentioned above. These two spots were also depicted by Hare on December 28, 1949; refer to Figure 6 on pg. 1 of our February issue.

In January and February E. E. Hare obtained results of much interest in the field of colors on Mars with his comparatively large reflector. Mare Sirenum has exhibited to him "a clear light blue", and Mare Erythraeum has shown "a bluish slate". Acidalium and neighboring dark marks (canals) have been "brownish slate." Blues have been present chiefly in the southern <u>maria</u>, and browns have chiefly affected dark northern marks, including canals. On February 11 and 17 Hare found a curious red cast to most markings following about longitude 100°. This red even affected Fortuna and Iris canals on February 11. It may be remembered that Dr. Edison Pettit has observed green in the canals of Mars. Can they be red or brown also? Mr. Hare points out that if the material of the canals (Martian plants, or what have you) is actually green or blue but does not cover the underlying orange or red surface completely, then a color of brown might well result as a blend of the different hues. It appears evident that browns in the <u>maria</u> might be similarly produced. Since Mars is surely at least as dry as most deserts on the earth, it would appear natural to expect Martian plants to cover the soil only partially, not completely.

MISCELLANEOUS

We mentioned on pg. 9 of the December, 1949, Strolling Astronomer that E. E. Hare had found Cleft V in the lunar crater Conon to be plainly present on a Yerkes Observatory photograph taken in 1909. This photograph, we understand, is on pg. 79 of McKready's Handbook of the Stars and was evidently taken near colongitude 148°. The cleft is revealed on the photograph as a dark band running approximately north-south across the floor and has a white border on its west side, presumably the west bank of the cleft.

On pg. 2 of our November, 1949, issue it was told how Mr. David W. Rosebrugh and a companion had found the sun's light apparently to diminish in "steps" rather than continuously at a 1932 solar eclipse. Mr. Rosebrugh considered this effect an optical illusion of some kind, and it is interesting that Mr. Donald O'Toole has found an apparently similar effect on the moon. Writing on November 13, 1949, he told how as he was staring at the gibbous moon with his unaided eye the moon suddenly seemed to dim, while the surrounding glare almost disappeared. The moon then brightened again, and next the whole cycle was repeated over and over. The period of the light-changes was about four seconds. Mr. O'Toole found that concentration of eye and mind upon the moon was seemingly quite enough to produce the effect.

On pg. 13 of the November issue we mentioned Mr. John J. O'Neill's report of a curious doubling of the telescopic image of Saturn. We have had correspondence on this subject from R. R. Lee, C. B. Stephenson, and D. O'Toole. Lee has frequently observed exactly what O'Neill described, using Milwaukee Astronomical Society Observatory instruments on planets at a low altitude in a dawn sky and affected by "atrocious" seeing. The double image has been especially obvious with the planet Saturn, probably because of the rings. Lee thinks from memory that adjustment of the focus does not always remove the doubling effect but is not sure. Stephenson writes of an observation of Saturn by R. Wild and himself with a 6-inch refractor on November 11, 1948. The seeing was very bad, "extremely and rapidly varying." Wild remarked that the image occasionally looked double, the displacement being along the minor axis of the ring-ellipse. Stephenson thinks from memory that he noticed that when the oscillations were of constant amplitude for a while, then the image seemed slightly sharper when it was briefly stationary at the two end-points of its path of oscillation. He is not entirely certain that he saw what Wild saw and is still less sure that his explanation applies to what O'Neill saw. O'Toole saw a doubled image of Saturn with a 6-inch reflector at 120X in the spring of 1949. The doubling was in a north-south direction, as for O'Neill and Wild also; and the distance between the two images was about equal to the diameter of the planet. The seeing was perhaps not especially poor, for O'Toole writes from memory that the rougher details were visible in both images. He thought at first that his newly completed telescope was defective; but though "no changes or adjustments" had been made since then, the effect had never been repeated when he wrote on November 13, 1949. O'Toole goes on to suggest that "there is a tendency for a double image to result when the image is not perfectly focused, either when the eye or the telescope is not coming into perfect focus."

During the year 1950 both the earth and the sun will be close to the plane of the equator of Jupiter. There will accordingly occur occultations of one satellite by another and eclipses of one satellite by the shadow of another. The following list of predicted occultations is taken from pg. 30 of the 1950 Handbook of the British Astronomical Association. Since most of these phenomena will not be visible in North America, we hope that our colleagues overseas will make good use of this list.

Date	Phenomenon	Begins	Ends
1950, March 28	Occultation of I by II	13^h 19^m, U.T.	13^h 26^m, U.T.
April 1	"	2 38	2 46
April 4	"	15 59	16 8
April 8	"	5 21	5 31
April 11	"	18 46	18 57
April 15	"	8 12	8 25
April 15	"	20 0	20 19
April 18	"	15 44	15 58
April 19	"	7 27	7 43
April 19	"	15 43	16 0
April 22	"	11 20	11 38
April 22	"	19 0	19 18
April 23	"	5 20	5 34
April 26	"	1 11	1 38
April 26	"	6 19	6 43
April 26	"	18 52	19 3
April 30	"	8 18	8 26
May 3	"	21 43	21 47
December 7	Occultation of II by I	11 57	12 2
December 11	"	1 20	1 27
December 11	"	18 20	18 42
December 14	"	14 48	14 57
December 18	"	4 19	4 32
December 21	"	17 52	18 11
December 22	"	0 31	1 1
December 25	"	8 4	8 36
December 25	"	11 37	12 20