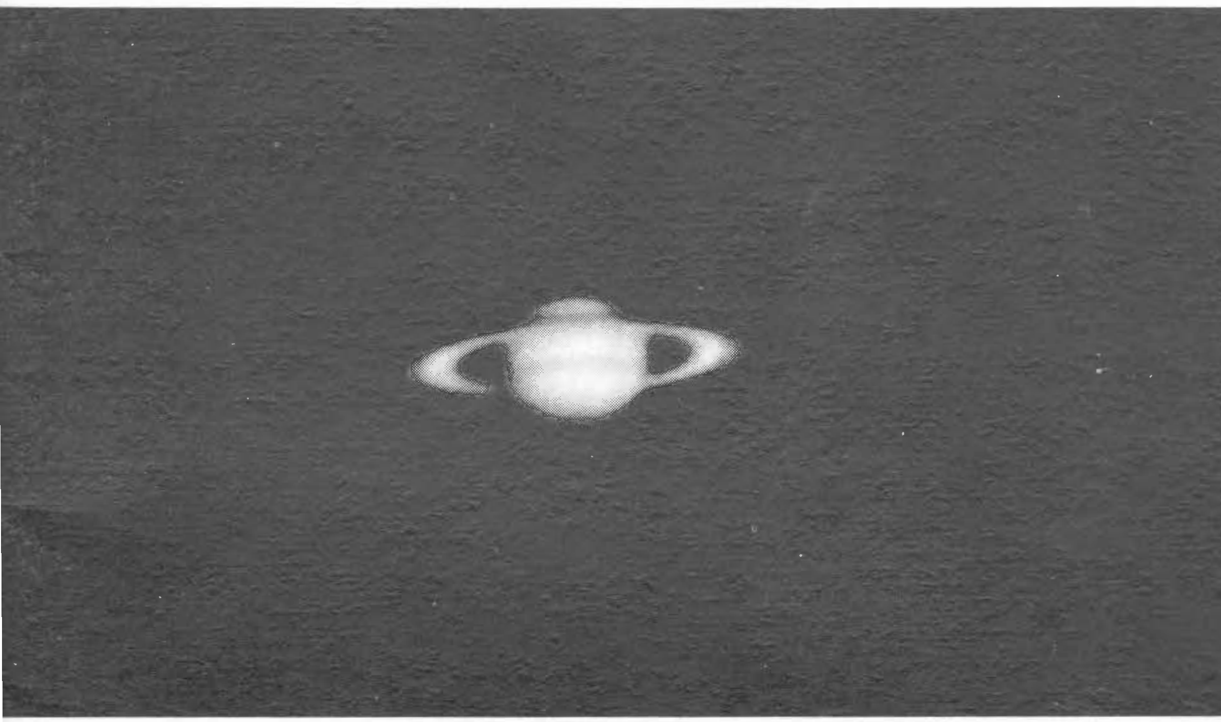
The Journal Of
The Association Of Lunar
And Planetary Observers

The Strolling Astronomer

Volume 17, Numbers 11-12

November-December, 1963
Published May, 1964



Photograph of Saturn by C. F. Capen with the Table Mountain Observatory 16-inch Cassegrain reflector. April 29, 1963. Plus X film. No filter. 1260 ins. e.f.l. 5 secs. exposure. Integrated light. Shadow of rings on ball above rings, shadow of ball on rings at lower left. Ring B much brighter than Ring A. Note bright Equatorial Zone, prominent North Equatorial Belt, and rather indefinite North Polar Band. In 1964 rings are much less open than here shown. South at top.

THE STROLLING ASTRONOMER

Box 26
University Park, New Mexico
88070

Residence telephone 524-2786 (Area Code 505)
in Las Cruces, New Mexico

ASSOCIATION OF LUNAR & PLANETARY OBSERVERS

Founded In 1947

IN THIS ISSUE

MARS OBSERVATIONS, 1962-1963, BY ALAN BINDER - PAGE 217

KEPLER, BY ALIKA K. HERRING - - - - - - - - - - - - - - PAGE 220

A.L.P.O. LUNAR SECTION REPORT: OCTOBER 1962 - DECEMBER, 1963, BY JOHN E. WESTFALL, CLARK R. CHAPMAN, AND HARRY D. JAMIESON - PAGE 221

A.L.P.O. COMETS SECTION REPORT FOR 1961, PARTS II AND III, BY D. MEISEL - - - - - - - - - - PAGE 227

A.L.P.O. COMETS SECTION REPORT FOR 1962-1963, PART I, BY D. MEISEL - - - - - - - - - - - - PAGE 232

VARIATIONS IN THE SOUTH EQUATORIAL AND NORTH EQUATORIAL BELTS OF JUPITER, 1941-1963, BY JAMES C. BARTLETT, JR. - PAGE 235

COMPUTING THE CENTRAL MERIDIAN OF JUPITER, BY WALTER H. HAAS - - - - - - - - - - - - - PAGE 237

AN OBSERVATION OF THE SOUTHWEST INNER WALL (IAU SENSE) OF ARISTARCHUS, BY HARRY D. JAMIESON - - - - - - - - - - - - - - PAGE 241

BOOK REVIEWS - PAGE 243

PLUTO DURING 1964, BY JAMES W. YOUNG - - - - - - - - PAGE 246

ANNOUNCEMENTS - PAGE 246

VENUS SECTION REPORT: EASTERN APPARITION, 1962, FIRST PORTION, BY WILLIAM K. HARTMANN - PAGE 248

THE TOTAL LUNAR ECLIPSE OF DECEMBER 30, 1963, BY WALTER H. HAAS - - - - - - - - - - - - - - - PAGE 255

AN INVITATION FROM NASA TO THE ALPO - - - - - - - - PAGE 259

MARS OBSERVATIONS, 1962-1963

By: Alan Binder

Introduction

During the aphelic apparition of Mars in 1962-1963 I was able to make a series of fairly continuous observations of the planet. All my observations were made with a 4" F/7.25 reflector, using a 4mm. othoscopic ocular giving 184X. Between Nov. 10, 1962 and May 17, 1963 fifty-two observations were made; however, most of the observations (46) were made between Dec. 21 and April 7. The primary objective of my program was to observe the white and/or blue clouds which are associated with an aphelic apparition. Secondary objectives were to observe the surface detail and the "melting" of the north polar cap.

Surface Detail

The map, Figure 1, shows the general appearance of Mars during the apparition. As expected, the features became more distinct as the northern spring advanced. This was especially noticeable in Mare Acidalium, the Utopia-Thoth Nepenthes complex, and the Syrtis Major.

North Polar Cap

Figure 2 shows the decrease in the diameter of this polar cap with increasing heliocentric longitude (η). The northern spring starts at $\eta = 87^\circ$ and ends at $\eta = 177^\circ$. The diameter of the cap is given in terms of the radius of the planet as the unit. When these data were plotted on a larger scale, it was apparent that there were periodic irregularities in the "melting" curve. As a result, a plot of the apparent width of the cap in the north-south direction was made. Again the same periodic irregularities were found. This second plot allowed the irregularities to be associated with particular Martian longitudes. Both the shape of the cap and the amount of offset of the polar cap with respect to the areographic north pole could then be determined. The results were normalized to η about 135° and are shown in Figure 3. The circle represents the 75th parallel of north latitude. The center of the cap was found to be at $88.^\circ5$ N. latitude and 320° longitude. This result is in good agreement with the values given by Lowell (Lowell, 1911, pp. 68-69), about 89° north latitude and 290° longitude.

White and Blue Clouds

The clouds observed were broken down into four types: (1) South polar haze. (2) Morning clouds, well-defined, white clouds on the morning side of the disk. (3) Morning haze, a poorly defined, arc-shaped, bluish white "cloud" on the morning limb or terminator. (4) Evening clouds, similar to morning clouds but on the evening limb of the disk.

The south polar haze was observed seven times before $\eta = 132^\circ$, but never afterwards.

Morning clouds were observed once following the northern part of the Syrtis Major, once in the Amazonis-Castorius Lacus region, three times in Tempe closely following Acidalium, once preceding Margaritifer Sinus, and three times preceding Thoth Nepenthes.

Morning haze was associated with the Syrtis Major once, twice with Thoth Nepenthes, once preceding Acidalium, three times in Tempe following Acidalium, and once with Trivium Charontis. On February 5 in a span of two hours a morning cloud developed from a morning haze arc.

There were only three evening clouds observed. In each case they preceded the northern part of the Syrtis Major.

A total of 27 clouds or haze layers was recorded. Every time that

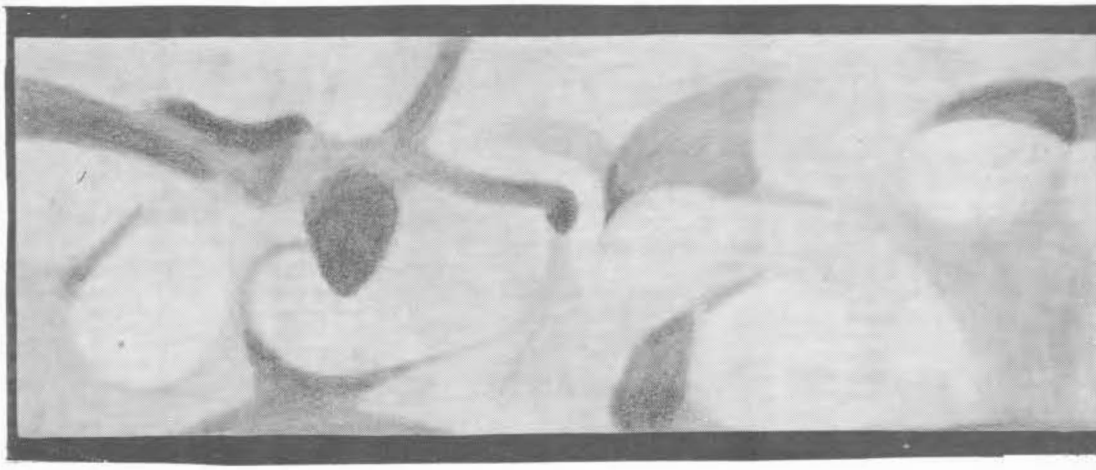


FIGURE 1. Map of Mars by Alan Binder. Based on observations with a 4-inch reflector between November 10, 1962 and May 17, 1963.

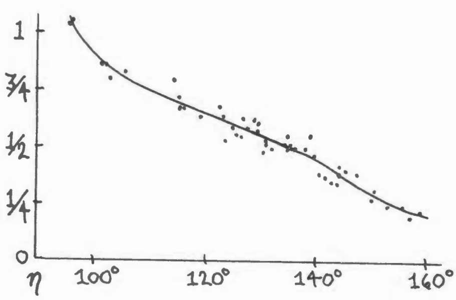


FIGURE 2 (left). Shrinking of north polar cap of Mars in the 1962-3 apparition, according to observations of Alan Binder. The diameter of the cap, in terms of the radius of Mars as the unit, is plotted against the heliocentric longitude η of the planet. Vernal equinox of northern hemisphere at $\eta = 87^\circ$, summer solstice at 177°.

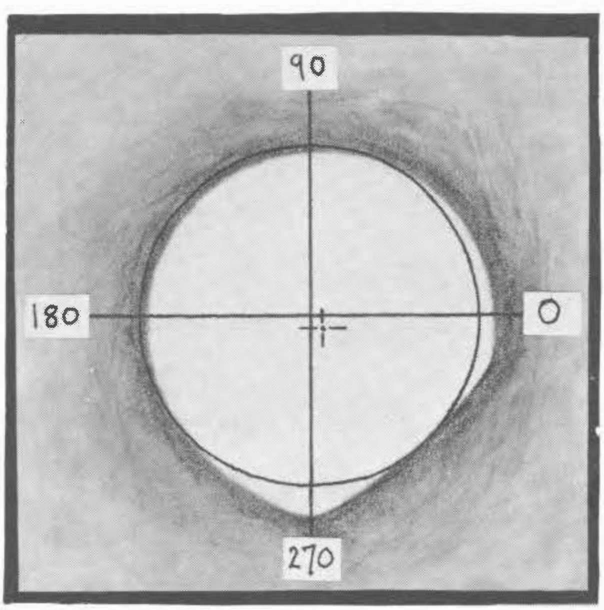


FIGURE 3 (left). Extent of north cap of Mars in different longitudes in 1962-3, according to observations of Alan Binder. The circle represents latitude 75° N.; the aspect is for $\eta = 135^\circ$. See also text of Mr. Binder's article.

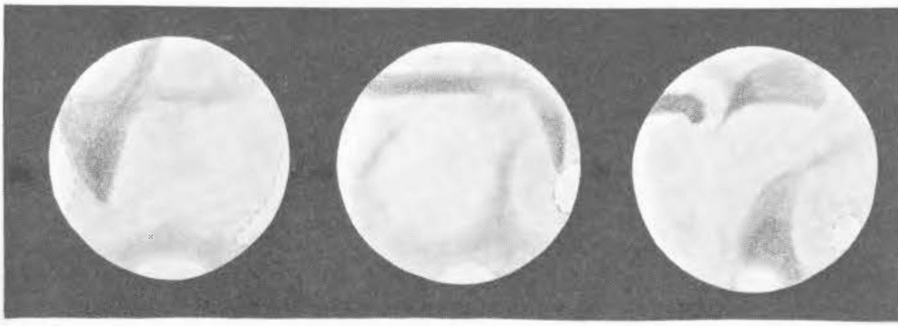


FIGURE 4. Typical observations of Martian white and blue clouds by Alan Binder with a 4-inch reflector during the 1962-3 aphelic apparition. Note clouds on morning and evening edges of planet and morning haze arc. See also text.

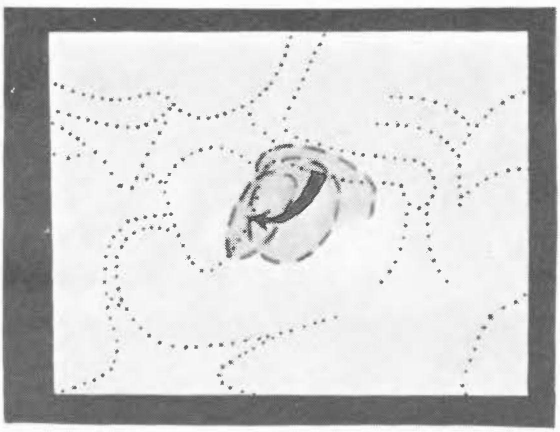


FIGURE 5 (left). Yellow cloud observed on Mars over Aeria by Alan Binder with a 4-inch reflector. Successive positions on February 24, 25, and 26, 1963 are indicated. Arrow shows direction of motion of cloud. Dashed lines show outlines of major features on Mars. Syrtis Major left of cloud; Sinus Sabaeus above it. See also text.

the Syrtis Major was observed either entering or leaving the disk, a cloud was associated with it. Similarly, when Acidalium entered the disk, it was followed by a cloud. Figure 4 shows the appearance of a few of the morning and evening clouds and a morning haze arc.

Yellow "Dust" Cloud

A completely unexpected "cloud" was observed between $\eta = 143^\circ.5$ and $\eta = 144^\circ.4$ (Feb. 24 to 26). During this time a yellow dust cloud moved across the Aeria desert. This was surprising since dust clouds are associated more with perihelic apparitions. Figure 5 shows the cloud's positions for February 24, 25, and 26. Since I have no observation between February 21 and 24, it is uncertain as to exactly when the cloud actually formed. Estimates of the velocity of the cloud are 30 to 40 kms./hour between the first and second day that it was observed, and 10 kms./hour between the second and third day. These velocities are in good agreement with other values (De Vaucouleurs, 1952, pg. 343) and suggest that the cloud was no more than one day old when first observed.

When first observed on February 24, the cloud obscured part of Sinus Sabaeus; but due to poor seeing, the exact shape and color were not determined. On the next night, February 25, the seeing was quite good, and the color was noted as golden yellow. The cloud was well defined and was encroaching on the Syrtis Major. On February 26 the golden yellow color was vivid, but the cloud was less distinct than on the night before. This was the last observation of the cloud itself, but the desert did not return to its normal pink hue until sometime after March 1. Thus the "dust storm" affected the appearance of the area for at least 5 days, first by the "storm" itself and later by the fine dust which was settling out of the atmosphere.

Table 1 tabulates the data described above.

References

de Vaucouleurs, G., 1952, Physics of the Planet Mars, Faber and Faber, London.

Lowell, Percival, 1911, Mars and Its Canals, Macmillan, New York.

Table 1

Date	Time (U.T.)	λ	PH	MC	MH	EC	DS
1962, Dec. 21	7:40	$114^{\circ}.6$	X				
23	8:30	115.4	X				
1963 Jan. 01	6:10	119.1			TC		
09	5:50	123.1	X				
13	6:25	125.0	X				
14	5:45	125.4			TP		
16	5:15	126.3			TP		
17	6:10	126.7			TP		
18	4:50	127.6				SM	
*20	5:25	128.1			AD	SM	
23	5:35	129.4	X				
26	7:10	130.8	X				
27	5:20	131.2	X				
** 28	4:50	131.6		SM			
30	5:50	132.5			SM		
Feb. 05	5:35	135.2			TN		
05	7:55	135.2		TN			
06	5:40	135.6			TN		
15	3:55	139.6		AC			
***18	3:05	140.9		TP			
20	3:45	141.8		TP			
21	4:00	142.2		TP			
24	3:50	143.5					Ar
25	3:40	144.0		MS		SM	Ar
26	3:50	144.4					Ar
Mar. 12	3:40	150.5		TN			
13	5:40	151.0		TN			

* Fig. 4, left drawing. ** Fig. 4, center drawing. *** Fig. 4, right drawing.

PH - Polar Haze
MC - Morning Cloud
MH - Morning Haze
EC - Evening Cloud
DS - Dust Storm

X - a positive result for the PH
TP - Tempe, usually very close to Acidalium
TN - Thoth Nepenthes
Ar - Aeria
MS - Margaritifer Sinus
TC - Trivium Charonitis
SM - Syrtis Major
AD - Acidalium
AC - Amazonis - Castorius Lacus area

KEPLER

By: Alika K. Herring

Kepler is a typical example of one type of crater that is fairly common on the lunar surface. Other familiar craters that are similar, not only in size, but also in the nature of their interior details, are Sabine, Ritter, Encke, and Marius. Of these,only Kepler is unusual in being the center of a bright nimbus and ray system.

Despite its location well away from the lunar limb, Kepler apparently has not been well observed; and to the best of my knowledge no satisfactory chart of the interior details has yet been made. The exact nature of these features may therefore be somewhat obscure. For example, under a somewhat higher lighting a dusky streak or band appears to cross the center of the floor in a north and south direction; yet at the time my drawing (Figure 6) was made, I clearly observed a complex row of small hills and ridges in exactly the same position.

I also observed a system of terrace-like ridges inside, and concentric with, the west (cartographic or I.A.U. direction) wall, as well as two very minute craterlets located on the largest of these (Figure 6). These small pits apparently have not been previously reported, and other observers should therefore make an effort to confirm them.

Kepler is generally polygonal in outline; and it is interesting to note that at least two sides of the polygon, on the north and northwest, appear to continue beyond the crater walls as lines of faults.

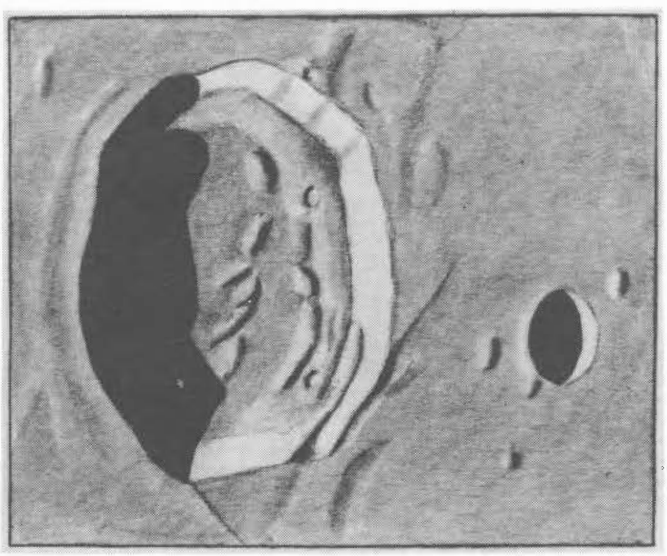


FIGURE 6. Lunar Crater Kepler. Alika K. Herring. January 26,1964. $2^h 10^m$, U.T. 12.5-inch refl. 268X. Seeing 5-6. Transparency about 6. Colongitude 50°.8. See also text of Mr. Herring's article.

A.L.P.O. LUNAR SECTION REPORT: OCTOBER, 1962 - DECEMBER, 1963

By: John E. Westfall, Clark R. Chapman, and Harry D.Jamieson, A.L.P.O. Lunar Recorders

I. INTRODUCTION

By: John E. Westfall

General

In October, 1962, the writer had the honor of being appointed a Lunar Recorder in the A.L.P.O. Since the entire Lunar Section underwent a reorganization then, this report covers the Lunar Section's activities since that time. An article by the writer, "Prospects for the A.L.P.O. Lunar

Section" (Strolling Astronomer, Nov.-Dec., 1962, pp. 273-275), has outlined as a Lunar Section project a Selected Areas Mapping Program. At the present time, response to this program has fallen below expectations, possibly duo in part to the specialized approach which this program requires. For this reason, the Lunar Section has initiated several parallel studies which, it is hoped, will result in a more diversified overall program. These parallel studies are discussed in the other sections of this report. A.L.P.O. members are urged to contribute suggestions and comments to the Lunar Recorders as this is the only way in which the Lunar Section can conduct a program satisfactory to the membership at large.

A.L.P.O. Lunar Section Conventional Usages

In order to compile useful reports for publication, some degree of conformity in observations submitted is required:

a. There has been considerable recent discussion as to the east-west convention in selenography (Ref: "Concerning the Usage of East and West on the Moon", Strolling Astronomer, Jan-Feb., 1963, pp. 35-36). At the present time, the Lunar Section (with the exception of the Lunar Dome Section, see below) will accept observations using either the classical system (i.e. Mare Crisium near west limb) or the I.A.U. system (i.e., Mare Crisium near east limb). To avoid confusion, however, all observers must indicate which system they use. Where reference to cardinal direction is made only once or twice, the system used may be indicated in the text, with the note, "(Old)", for the classical system, and the note, "(IAU)", for the I.A.U. system. Such a procedure would be cumbersome if there are many references, and in such cases a general note at the beginning of the report (or article) will suffice. Final Lunar Section reports and maps will use the I.A.U. convention in order to conform with the USAF-ACIC LAC series and with professional observations.

b. In any reference to lunar dimensions, the Lunar Section uses the metric system; horizontal distances or dimensions are in kilometers (km), while altitudes are in meters (m). Observers are asked to follow this system in submitting observations in order to avoid the necessity for unit conversion, which always is a possible source of error.

c. All numerical quantities dependent on the dimensions of the moon (for example, altitudes) consider the moon as a sphere of radius 1738.0 kms.

Appreciation

The writer would like to take this opportunity to thank the other members of the Lunar Section's staff - Patrick McIntosh, Clark Chapman, Harry Jamieson, and José Olivarez - for their generous and indispensable efforts. It is indeed a privilege to be able to work with such enthusiastic and competent students of the moon!

II. SELECTED AREAS MAPPING PROGRAM

By: John E. Westfall

The Selected Areas Mapping Program was conceived with the belief that amateur astronomers can make substantial contributions to selenography by means of the intensive, systematic study of selected lunar areas. The general goals and methods of such a program have been outlined in a previous article ("Prospects for the A.L.P.O. Lunar Section", Strolling Astronomer, Nov.-Dec., 1962, pp. 273-275) and need not be repeated here.

After consultation with interested observers and with members of the A.L.P.O. staff, the Aristarchus-Herodotus region was designated the first "Selected Area." This decision was communicated to the membership in the

"Announcements" section of The Strolling Astronomer (Jan.-Feb., 1963, pp. 40-41), at which time mimeographed outline charts of the region, for use at the telescope, were made available to interested observers. Mr. Patrick S. McIntosh (address: Sacramento Peak Observatory, Sunspot, New Mexico, 88349), as a Lunar Recorder, is in charge of distributing these outline forms. Completed forms are to be returned promptly to him in order to be utilized in the compilation of a "master" orthographic chart, a necessary step in the production of the final map. At the present time, Mr. McIntosh reports a discouragingly poor response; only a handful of completed observing forms have been returned. Thus, the compilation of a reliable "master" chart is impossible as yet.

Those who have contributed, however, deserve credit: these include Patrick McIntosh, Harry Jamieson, Larry Anthenien, Kenneth Delano, George Rippen, William Snyder, and Kenneth Schneller. Clearly, more observations are needed. Particularly necessary are, (i) observations of the Aristarchus-Herodotus region under afternoon lighting, and (ii) photographs. Observations with large apertures (12 inches and above) are especially desirable. although useful contributions can be made with smaller instruments. Interested observers who have not yet contributed to the program should request observing forms from Mr. McIntosh.

Other phases of the Selected Areas Mapping Program are somewhat more encouraging. The 1:250,000 relief model of the region is now being constructed by the writer, but more high quality amateur photographs of the region are needed to complete the model since the professional photographs available do not give an adequate colongitude coverage.

The writer would like to express his gratitude to Mr. Lincoln E. Bragg for his generous and untiring efforts in computing relative altitudes for the region from photographic measures of shadow lengths. To date Mr. Bragg has computed no less than 65 elevations! Mr. Harry D. Jamieson has also contributed several measured elevations, as well as several invaluable profile studies. Thus, the Vertical Control Phase of the Program is progressing well.

Most readers of this report will be familiar with the recent observations of possible "reddish patches" in the Aristarchus area. Because Mr. Chapman discusses these phenomena in his section of this report, they are not discussed here, aside from the comment that, by an exceptionally lucky coincidence, all three suspected areas of change lie within the region being studied. This fact should encourage more intensive observations of the Aristarchus-Herodotus region.

Several writers have commented that one reason for the discouragingly few observations received of the Aristarchus-Herodotus region is that the region can be observed in the evening only for part of a lunation. This suggests the need for the designation of one or more other Selected Areas, in other parts of the visible lunar hemisphere. For example: (i) Arago, Manners, and the great dome west (IAU) of Arago, (ii) the Hyginus or Triesnecker clefts, and (iii) Messier and W. Pickering, are all being considered as possible future Selected Areas. Naturally, this short list is not an exclusive one; the Lunar Recorders are anxious to hear other members' suggestions as to the choice of future Selected Areas. It will probably be necessary, however, to restrict any future Selected Area to, at most, an area 60 by 60 kms.

III. LUNAR TRAINING PROGRAM AND RELATED ACTIVITIES

By: Clark R. Chapman, Lunar Training Program Recorder

This report describes the activities during the past year of the Lunar Training Program and other Lunar Section projects which I have undertaken to handle.

The Lunar Training Program is designed to aid and guide observers new to the study of the moon. Several standard crater outline forms have been prepared in connection with the program described in the initial article (Str. A., pp. 45-49, Mar.-Apr., 1963). Very few observations on these forms have been returned, and it seems that nobody is actively following the suggested training program. On the other hand, a number of observers have had questions which I have been trying to answer. As the next step in the Training Program, I plan to rewrite the original article (bearing in mind the questions most frequently asked) for inclusion in the A.L.P.O. Observing Manual, on which work is well under way.

For more advanced observers, the study of central peaks and central peak craterpits suggested by Charles Wood and myself (Str. A., pp. 162-163, Jul.-Aug., 1963)would be a valuable organized research project for someone interested enough in the moon to do more than casual observing. In the same category is Dr. Ashbrook's proposed systematic search for unusually steep places on the moon's surface, which I am handling (Str. A., pp. 136-137 & 164, Jul.-Aug., 1963). It would seem most unfortunate if there were no one in the whole A.L.P.O. to work on these interesting and comparatively easy projects.

The recent observations of color in the Aristarchus region may be among the most significant lunar observations ever made. ALPO'ers interested in the moon should use the next several lunations to full advantage to watch for a possible recurrence of the phenomena. If the colored spots are in fact caused by some sort of degassing mechanism, the observations are of the utmost significance. It has been suggested, however, by Ernst Both that the color changes may be nothing more than usual color changes which he says are well-known to experienced lunar observers. He reports that many bright mountain peaks have at times shown short-term color effects at very special solar illuminations and librations. Observations of not only the Aristarchus region, but also of other bright features on the moon, would be very valuable for a further understanding of these unusual observations by Lowell observers. I have received a large number of observations (mainly negative) of color in the Aristarchus region, and I hope that the enthusiasm lasts long enough to lead to conclusions about these interesting phenomena. Further observations are strongly urged.

For those who have been corresponding with me at my Arizona address, my mailing address is once again: 2343 Kensington Ave, Buffalo 26, New York, 14226.

IV. THE LUNAR DOME SECTION

By: Harry D. Jamieson

There has long been a need for a serious and coordinated effort to discover, confirm, and study large numbers of lunar domes. This Section has recently been set up with this need in mind. Our purpose is to create programs of dome research and to collect, analyze, and publish in regular Section Reports observations made by interested observers. These programs will include work on many aspects of dome research, such as discovery and confirmation, diameters and heights, surface features, distribution, and dome contours, programs suitable for all from the novice lunar observer to the most advanced amateur.

In many of these areas, much work has already been done. Over 320 domes have been located during the past year, and about half of these have been well confirmed. However, recent studies show that this number, large as it may seem, is but a fraction of the true number of these objects which have yet to be found. Recently, therefore, it was decided that the first program to be undertaken by the new Section should be one of discovery and confirmation.

A. Program Number One: Discovery and Confirmation.

The purpose of this program is simple: we must first locate domes before we can seriously study them. Here, observers who have not had much experience in advanced work can contribute much and at the same time gain experience for the later and more difficult work. Our general plan of action for this first program will be to pass out small-scale maps of the Moon to each interested observer, who will then take them to the telescope and (as the case may be) indicate whether or not he has seen a particular unconfirmed dome or has found a new one. These charts will be kept by the observer for a time and will then be turned in when called for (the observer will receive a new chart in return.) New domes should be marked in blue, confirmed domes in red. Observers will list on the reverse of the chart the exact positions of any new domes found, as well as the source from which the positions came.

One idea on which we would welcome comments is that of an exhaustive survey of one or more selected lunar regions for domes. It would be valuable if the statistical data thus found could then be extrapolated to the whole moon. The regions selected must be small enough that one can hope to obtain data complete for the apertures used in a reasonable time.

B. Instrumental and Other Requirements

These requirements will apply for all programs which this Section undertakes unless otherwise stated.

1. Telescopic. This requirement will, of course, vary somewhat with the program currently underway; but in general it is safe to set a lower limit of four inches in the case of a refractor and six inches for reflectors. Larger instruments are, of course, to be preferred, and it is asked that the observer use the largest one possible.

2. Observational Procedures. All observers must use the new I.A.U. lunar directions when making observations for this Section. They are also asked to use the revised transparency scale adopted recently by the A.L.P.O. Also, where forms are provided, these forms must be used.

3. Reference Material. Observers should have some sort of reliable large-scale lunar chart. Preferred would be any of the following: (i) the *Orthographic Lunar Atlas*, which is best, (ii) the Air Force *ACIC Charts* or, (iii) *The Moon*, by Wilkins and Moore. In any case, the observer must reveal which chart he is using; and the chart must have a usable coordinate grid.

4. Photographic and Other Accessories. These are not requirements, but observers having either photographic equipment or a micrometer (or those fortunate enough to have both) can be of special service to the new Section - particularly in this first program, where photographs can be used to help discover and confirm domes.

Participating observers will receive full credit for their efforts in our regular Section Reports, which will give detailed information on the progress of current programs as well as accounts of individual observations.

Interested observers who can meet the above requirements and who would like to participate in this much-needed work are asked to contact one of the two Recorders for this Section. Their addresses are given on the inside back cover of this issue. Since this is a new Section and since it is also *your* Section, members interested in offering constructive criticisms and suggestions will find a ready ear.

V. LUNAR ECLIPSES

By: John E. Westfall

As mentioned in the beginning of this report, the Lunar Section hopes

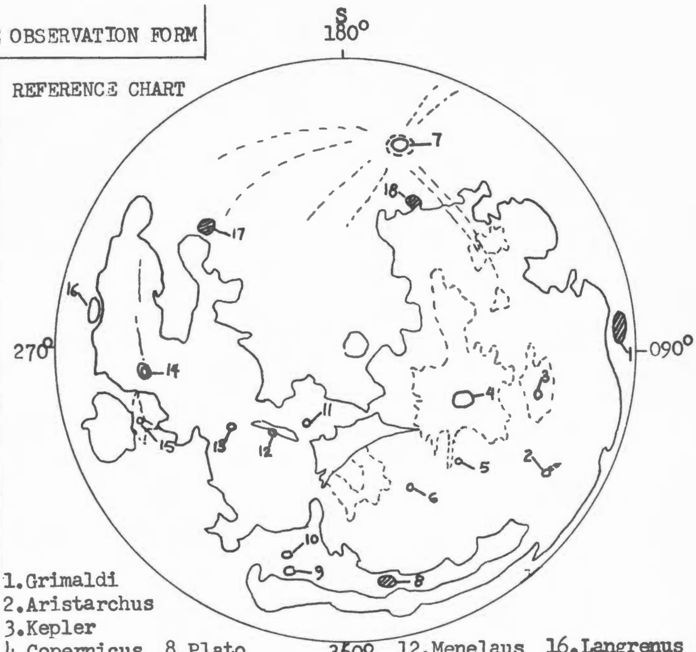
A.L.P.O. LUNAR SECTION - LUNAR ECLIPSE OBSERVATION FORM

OBSERVER...........................
DATE................. 19... (U.T.)
TIME.......U.T. TO....... U.T.
INSTRUMENT(S): MAGNIFICATION(S):
....
....
....
S(0-10)........T(0-5)........

(FOR OCCULTATIONS ONLY)
LATITUDE....°....'....." N S
LONGITUDE....°....'....." W E
ALTITUDE(Above Mean Sea Level)....FT.

NOTES(Continue on back if necessary):
....
....
....
....
....
....
....
....
....
....
....
....
....

REFERENCE CHART



1.Grimaldi
2.Aristarchus
3.Kepler
4.Copernicus
5.Pytheas
6.Timocharis
7.Tycho
8.Plato
9.Aristoteles
10.Eudoxus
11.Manilius
12.Menelaus
13.Plinius
14.Taruntius
15.Proclus
16.Langrenus
17.Fracastorius
18.Pitatus

CRATER TIMINGS

ENTERING UMBRA: Name	Time(U.T.)	LEAVING UMBRA: Name	Time(U.T.)
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....
....	....	....	....

OCCULTATIONS

Star	Est. Mag.	Disap. or Reap.	Time(U.T.)	Est. Az.	Notes
......	....	....	....	....	....
......	....	....	....	....	....
......	....	....	....	....	....
......	....	....	....	....	....
......	....	....	....	....	....
......	....	....	....	....	....
......	....	....	....	....	....
......	....	....	....	....	....
......	....	....	....	....	....
......	....	....	....	....	....
......	....	....	....	....	....
......	....	....	....	....	....
......	....	....	....	....	....
......	....	....	....	....	....
......	....	....	....	....	....

ECLIPSE LUMINOSITY (L) - CHECK ONE VALUE:

- ☐ 0: Very dark eclipse, moon almost invisible, especially in mid-totality.
- ☐ 1: Dark eclipse, gray or brownish coloration, details distinguishable only with difficulty.
- ☐ 2: Deep red or rust-colored eclipse, with a very dark central part in the shadow, and the outer edge of the umbra relatively bright.
- ☐ 3: Brick-red eclipse, usually with a bright or yellow rim to the shadow.
- ☐ 4: Very bright copper-red or orange eclipse, with a bluish very bright shadow rim.

FIGURE 7. Preliminary draft of proposed form for reporting lunar eclipse observations. Constructed by John E. Westfall, A.L.P.O. Lunar Recorder. See also text on page 227. Readers are asked to send criticisms and comments to Mr. Westfall or to the Editor.

to increase member participation in Lunar Section studies by means of a more diversified program. The Lunar Dome Section, directed by Mr. Jamieson, is an example of this, as the the central peak study, "steep places" study, and A.L.P.O. Observing Manual already mentioned by Mr. Chapman. This section of the report opens for discussion another possible project.

Many of the readers of this article will have observed the unusually dark lunar eclipse of December 30, 1963. Since three more eclipses are to occur in the near future (June 25th. and December 19th., 1964, and June 14th., 1965), and these also may be unusually dark, the question naturally arises: What can A.L.P.O. observers contribute in observing these eclipses?

It is not here proposed to duplicate publication of certain types of eclipse observations which are usually published in the Sky and Telescope magazine; for certain types of observations, the Sky and Telescope reports are necessarily more complete than any A.L.P.O. report, inasmuch as Sky and Telescope receives observations from a much wider circle of observers than do we. Examples of lunar eclipse observations published there include: eclipse coloration, eclipse darkness, penumbral shading, umbral enlargement (i.e., crater immersion and emersion timing), sky brightness, and whole-disc photography (Ref: "Moon Eclipse December 30th.", Sky and Telescope, Dec., 1963, pp. 324-327).

It is the writer's opinion that the types of observations listed above, although not to be published in The Strolling Astronomer, are valuable and should be encouraged by the A.L.P.O. In line with this view, the use of a "Lunar Eclipse Observation Form" is being considered. A prototype of this form (Figure 7) has been compiled and tested by several observers; granted favorable response, a revised form should be available by the next lunar eclipse. Probably the best procedure will be for the Lunar Section to forward such forms to interested observers, who would then send them directly to Sky and Telescope immediately after the eclipse. In this way, the A.L.P.O. will be assured of a favorable showing in the nation-wide report published in Sky and Telescope. A "Dummy Copy" of this form is included with this report, so that readers may study it and comment on it.

Lunar eclipse observations of a type more within the "territory" of the A.L.P.O. should rightly be published in these pages. Such observations would consist of detailed visual and photographic studies of selected lunar formations during totality and immediately before and after the eclipse. (Lunar Meteor studies, positive or negative, should, of course, be reported to Kenneth Chalk, the Lunar Meteor Search Recorder). Only in this way can physical lunar changes caused by the eclipse be detected and confirmed. This project takes on added importance in light of the alleged color changes in the Aristarchus area; if these are caused by rapid heating of the lunar surface material, one would expect them to recur immediately after an eclipse.

Two Strolling Astronomer references illustrating the physical surface observations desirable during a lunar eclipse are: (i) "The Coming Total Lunar Eclipse on November 18, 1956" by Walter H. Haas (May-Jun., 1956, pp.50-53), and, (ii), by the same author, "The Total Lunar Eclipse on November 18, 1956" (Jan.-Jun., 1957, pp. 64-72).

A.L.P.O. COMETS SECTION REPORT FOR 1961, PARTS II AND III

By: D. Meisel, A.L.P.O. Comets Recorder

In this second part of the 1961 report, the results of the quantitative data reduction will be presented and briefly discussed. Two comets, Comet Wilson 1961d and Comet Seki 1961f, were observed by the A.L.P.O. members and others mentioned in Part I of this report. Part I was published on pp. 165-167 and 170-171 of Str. A., Vol. 16, 1962, July-August issue.

Comet Wilson 1961d

This object was seen only for a brief period, disappearing from the range of moderate-size instruments less than 3 weeks after its discovery. This quick fading was not the only peculiarity; for during the last days of visibility the limits of its coma appeared to shrink rapidly, but the comet kept its extremely long tail. Orbital parameters show that the object was a sun-grazer. Evidently the close perihelion passage was responsible for making the object so spectacular for the short period of visibility. It is unfortunate that no spectra were taken of this object so that its structure could be studied in detail. However, from the evidence at hand, the following tentative conclusions are put forth:

1) This comet is representative of a type of comet that is only seen <u>after</u> perihelion.

2) From the extent of its tail and coma and from their seeming lack of detail, it would appear that little or no gas made up this comet.

3) Conclusion (2) is further supported by the comparison of photographs made in different spectral regions, which show features identically shaped and proportioned in both red and blue photographs. On the basis of previous experience, this result can only exist in the case of dust.

4) The abrupt disappearance of this object does not seem to be the result of disintegration through slow decay, but rather was an "anatomical" characteristic. On the basis of these conclusions the following hypothesis is advanced.

Comet Wilson was an asteroid or asteroidal-like body which was too small to permit detection until it got near enough to the sun to vaporize most, if not all, of its entire body at perihelion. Since it was small and possibly rocky, with very little gas content until it got quite close to the sun, it was not visible in emission before perihelion. After perihelion the outer layers (if the entire object did not vaporize, which is doubtful) or the vaporized material cooled off and condensed into small dust-like particles and were blown away by radiation pressure. This produced a very large dust tail. Eventually the comet got far enough away from the sun so that larger drops would be formed which could not be blown away. The comet would then appear to fade as the particle cross-section grew larger and particle number grew smaller.

The above hypothesis is somewhat simplified; and if particle pressure rather than radiation pressure is dominant, only the details are changed. From the observed behavior of Comet Pereyra 1963e it would look as if it also is in this group of physical objects. It is, however, too early to tell whether this view is more than just idle speculation.

The photometric observations of Comet Wilson are shown in Figure 8. These are the points corresponding to the heliocentric, unit geocentric magnitude as a function of heliocentric distance. The observations have been corrected for the effects of aperture differences according to Bobrovnikoff (<u>Contr. Perkins Obs.</u> No. 15). The photometric behavior after perihelion but before August 14, 1961 can be well represented by the equation $m = m_o + 2.5n_o \log r$, with $n_o = 4.5$ and $m_o = 8.4$. After August 14, the equation with $n_o = 31$ and $m_o = 13.4$ fits the points to a fair degree. Since these observations are far from numerous, the parameters should not be taken too literally. However, the break in the continuity of observation is definitely real since the Comets Recorder made extensive visual searches with an 8-inch reflector on the morning of August 18, 1961 with no success, although stars of 12-13th magnitude could be seen.

Comet Seki 1961f

This object was observed briefly by A.L.P.O. members before its rapid

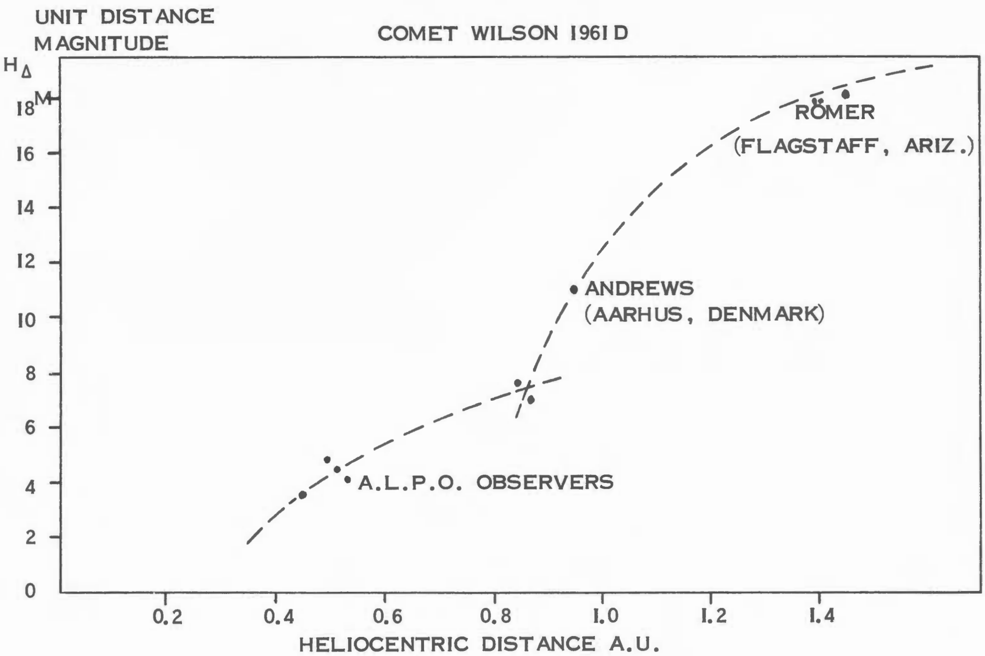


FIGURE 8. STANDARD APERTURE HELIOCENTRIC MAGNITUDES OF COMET WILSON PLOTTED AGAINST HELIOCENTRIC DISTANCE. SEE ALSO TEXT OF "A.L.P.O. COMETS SECTION REPORT FOR 1961, PARTS II & III". THE ORIGINAL GRAPHS FOR FIGURES 8, 9, 10, & 11 WERE CONSTRUCTED BY DAVID MEISEL AND HAVE BEEN PREPARED FOR PUBLICATION BY RAY MONTES.

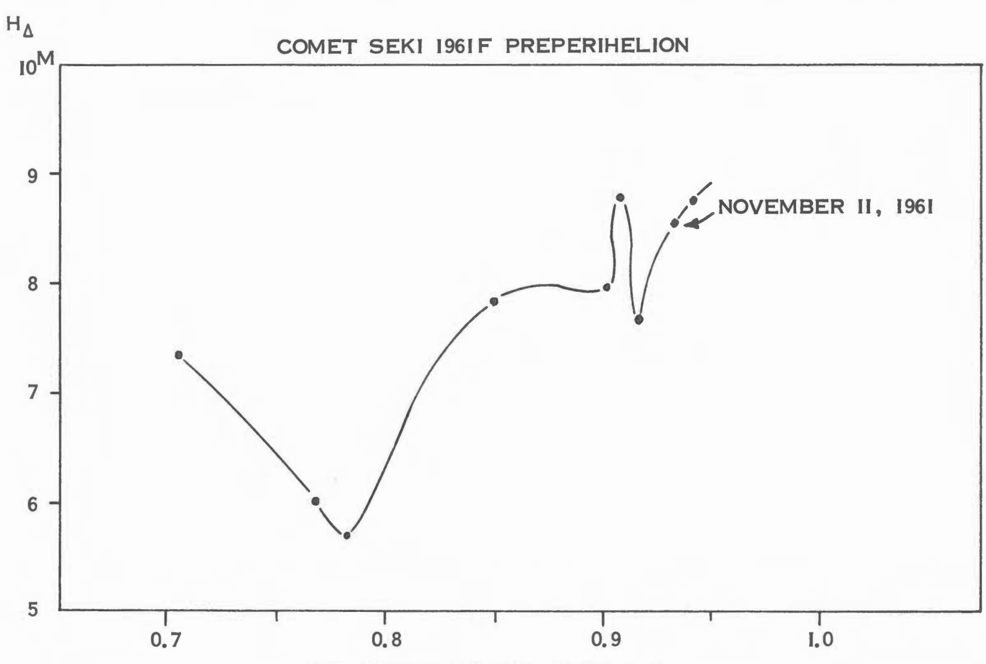


FIGURE 9. NORMAL PLACE STANDARD APERTURE HELIOCENTRIC MAGNITUDES OF COMET SEKI 1961F PLOTTED AGAINST HELIOCENTRIC DISTANCE. SEE ALSO TEXT.

daily motion, due to proximity to the earth, carried it too far south for observation from the northern hemisphere. The corrected magnitude estimates were averaged for particular dates and are graphed as a function of heliocentric distance in Figure 9. As can be seen, the brightness appeared to be subject to rapid fluctuations. A major portion of this variation can be due to the averaging of estimates by several different observers under different conditions. In any event the observations can be represented by selecting as the parameters in the above equation $n_0 = 7.2$ and $m_0 = 9.1$. However, these parameters should be applied with caution since the scatter is very great.

Although the photometric observations appeared to have a large scatter, a series of independent observations, may well indicate that not all of the scatter is due to observational factors. On the morning of November 11, 1961, six observers made magnitude estimates each separated by about half an hour in time. Each observer used a different instrument; and except for two, they were separated by a wide distance geographically. Before aperture correction the observations do not seem to be indicative of anything that is significant or new. However, when the correction is applied, a very peculiar time sequence emerges, as shown in Figures 10 and 11. Although it is possible that the appearance of the pattern is random, it would appear unlikely. Figure 10 shows the apparent magnitude, corrected for aperture, as a function of Universal Time. Figure 11 shows the estimated apparent diameter of the coma as a function of time. The numbers correspond to the following observers:

1) F. J. Price, A.A.A., New York, N.Y.
2) M. Schulze, A.A.A., New York, N.Y.
3) D. Meisel, Columbus, Ohio
4) C. Chapman, Buffalo, N.Y.
5) G. Rippen, Madison, Wisc.
6) L. Anthenien, San Jose, Calif.

H. Luft of the A.A.A. made observations on this date but unfortunately did not include accurate times of observation. If this observational sequence is real, then this is the first confirmed short-period comet brightness fluctuation made by A.L.P.O. members and indeed may be the first such series anywhere. Since the comet was very near the earth at the time, if the observed fading was due to solar corpuscular radiation, one would expect the onset of geomagnetic or other activity on the earth near the time of the observed magnitude changes. If the comet is assumed moving at right angles to the stream of particles, which would appear to be the most likely cause of the phenomenon, the dimensions of the stream can be estimated. On this date the comet was located about 0.93 A.U. from the sun and about 0.2 A.U. from the earth. Taking 20' as the apparent diameter of the comet, the linear size of the comet is then near 100,000 miles. Assuming parabolic mation, the comet would move its own diameter in one hour. If the whole event took $1\frac{1}{2}$ hours from start to finish, as was observed, the diameter of the solar stream comes out to be on the order of 200,000 miles. The comet was quite near the ecliptic at the time, having passed the descending node a week before.

Observers of this comet as well as geophysicists should check their data near Nov. 11, 1961 because the question of confirmation is an extremely important one. The Recorder would be interested in comments concerning these observations.

Figure 11 shows the comet's apparent diameter as reported by three observers during the interval in question. The observations appear to indicate a shrinkage of the apparent diameter, indicating perhaps that some dissociative process is operating. These three observations indicate a cometary particle decay of the form $e^{-t/T}$, where t is the time interval since a certain epoch time and T is the lifetime of the particles. The observations indicate a value for T of about 75 minutes. Since the mechanics of dissociation in comets is not well understood, it is not possible to say just what this figure really means. [Even the form of the functional

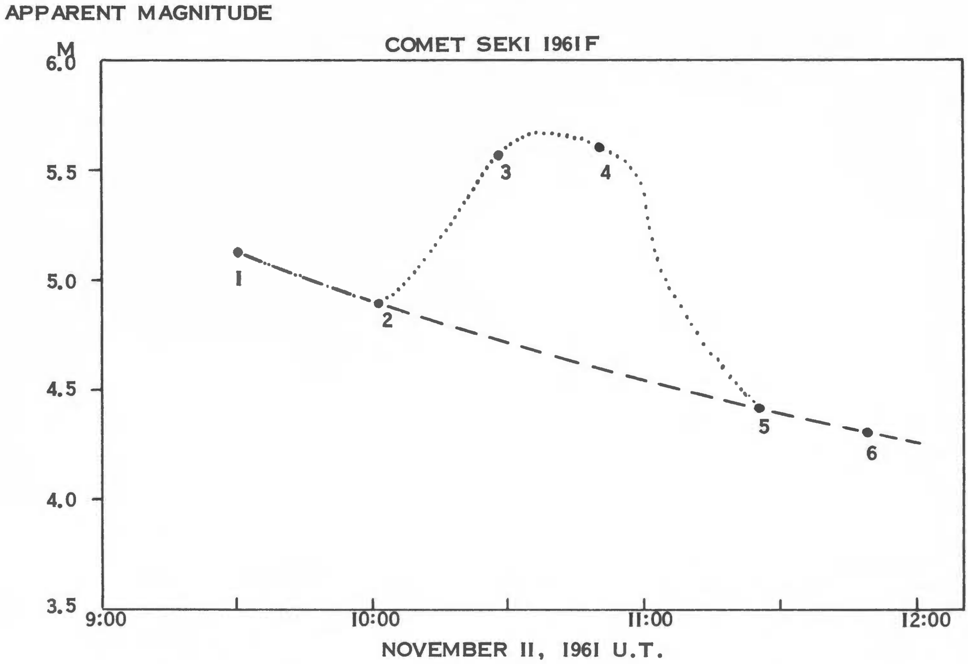


FIGURE 10. OBSERVED CORRECTED APPARENT MAGNITUDES OF COMET SEKI PLOTTED AGAINST UNIVERSAL TIME ON NOVEMBER 11, 1961. NOTE THE EVIDENCE OF VERY RAPID FLUCTUATION IN BRIGHTNESS. SEE ALSO DISCUSSION IN TEXT. MR. MEISEL REQUESTS AVAILABLE FURTHER DATA FROM OBSERVERS ON OR NEAR NOVEMBER 11, 1961.

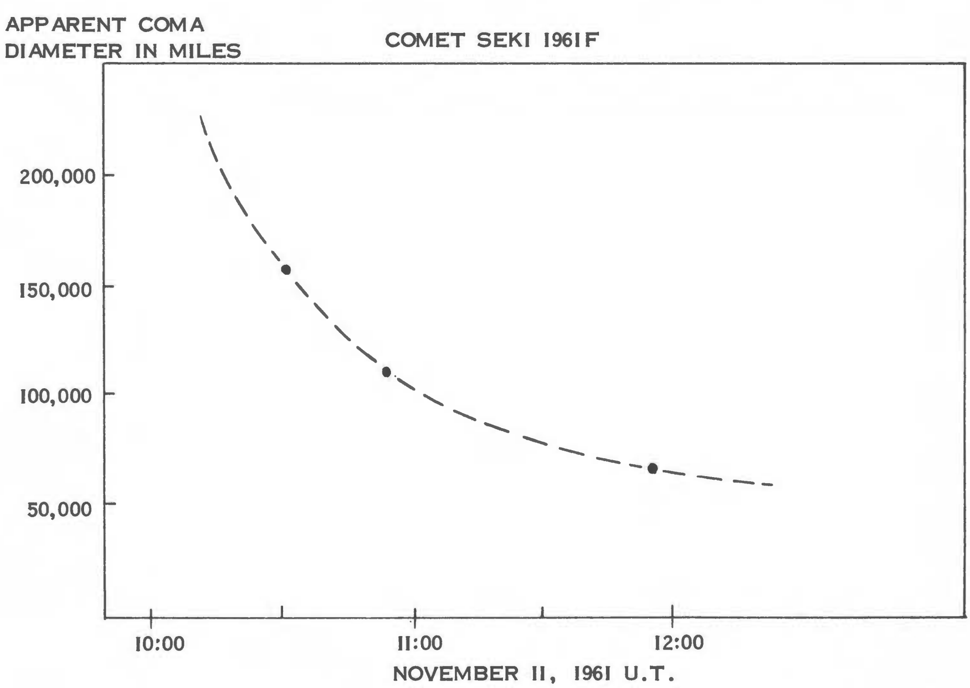


FIGURE 11. OBSERVED DIAMETER OF COMA OF COMET SEKI 1961F PLOTTED AGAINST UNIVERSAL TIME ON NOVEMBER 11, 1961. SEE ALSO TEXT. MR. MEISEL VERY MUCH DESIRES ANY AVAILABLE FURTHER OBSERVATIONS.

relationship between coma diameter and time must be uncertain with only three observations. A parabola would give a perfect fit, for example. - Editor]

TABLE I.
Photometric Normal Places

Comet Wilson 1961d

Date 1961 U.T.		(1)	(2)	(3)	(4)	
July	25.4	+ $3^m_.2$	+ $3^m_.5$	+ $3^m_.8$	0.45	A.U.
	26.4	+ 4.7	+ 4.8	+ 5.1	0.49	
	27.4	+ 3.5	+ 3.6	+ 4.9	0.51	
	28.4	+ 4.0	+ 4.1	+ 4.5	0.54	
Aug.	9.3	+ 7.0	+ 7.1	+ 7.6	0.84	
	10.3	+ 6.5	+ 6.6	+ 7.1	0.86	
	13.0	+11.5	+10.6	+11.1	0.94	
Sep.	6.4	+18.0	+18.0	+18.3	1.42	

Comet Seki 1961f

Date 1961 U.T.		(5)	(6)	(7)		(8)
Oct.	23.3	+ $7^m_.1$	+ $7^m_.4$	0.705	A.U.	-
	28.3	+ 5.3	+ 6.1	0.768		162,000 mis.
	29.4	+ 4.8	+ 5.7	0.780		-
Nov.	4.4	+ 6.1	+ 8.0	0.850		72,000 mis
	8.3	+ 5.3	+ 8.0	0.899		-
	9.3	+ 5.9	+ 8.8	0.904		48,000 mis.
	10.4	+ 4.4	+ 7.7	0.916		-
	11.3	+ 5.0	+ 8.6	0.927		126,000 mis.
	12.4	+ 4.9	+ 8.9	0.942		118,000 mis.

(1) Reported Apparent Magnitude.
(2) Aperture Corrected Magnitude.
(3) Standard Aperture Heliocentric Magnitude.
(4) Heliocentric Distance in Astronomical Units.
(5) Normal Place Magnitude (Standard Aperture).
(6) Heliocentric Magnitude (Standard Aperture).
(7) Heliocentric Distance in Astronomical Units.
(8) Coma Diameter in miles.

A.L.P.O. COMETS SECTION REPORT FOR 1962-1963, PART I

By: D. Meisel, A.L.P.O. Comets Recorder

This report covers the years 1962 and 1963. During this period observations of four of the brighter comets, Comets Humason 1961e, Seki-Lines 1962c, Ikeya 1963a, and Alcock 1963b, were received. As in previous years, the reports were of varying quality. A few reports have been received on Comet Pereyra (1963e), but these are not included in the present work. Only the data which permits quantitative discussion will be presented here. Likewise because of length limitations, only cursery comments or interpretations will be made. For the general stories of the various comets the reader is referred to the following articles:

E. Roemer, "Comet Notes", P.A.S.P., Vols. 74 and 75.
Sky and Telescope Magazine, Vols. 23, 24, 25, 26.
Comet Humason : See especially Aug., Sept., Oct., Nov., and Dec., 1962.
Comet Seki-Lines : June, 1962.
Comet Ikeya : April, 1963; March, 1963.
Comet Alcock : Apr.-May, June, 1963.
Comet Pereyra : November, 1963.

Comet Humason 1961e - List of Observers

J. Russell Smith	Eagle Pass, Texas	16" Refl.
D. Meisel	Fairmont, W. Va. and Delaware, Ohio	8" Refl. and 32" Refl.
Jay Jenkins		
Gordon Solberg	Las Cruces, N. M.	6" Refl.
Dennis Milon	Houston, Texas	8" Refl.
George Rippen	Madison, Wisc.	6" Refl.
Allen Montague	Oak Park, Illinois	6" Refl.
Clark Chapman	Tucson, Ariz.	36" Refl.
Larry Anthenien	San Jose, Calif.	6" Refl.
Darrell Conger	Elizabeth, W. Va.	7 x 50 Binoculars
William O. Roberts	Alameda, Calif.	5" Refr. Binoculars
Alan McClure	Los Angeles, Calif.	Binoculars
Haskell Willis	Lone Oak, Texas	4" Refl.

Comet Seki-Lines - List of Observers

Larry Anthenien	San Jose, Calif.	6" Refl.
Kanae Yamamoto	Hiroshima, Japan	10" Refl.
Robert Shayler	Houston, Texas	Binoculars, 8" Refl.
Paul Knauth	Houston, Texas	8" Refl.
Alan McClure	Los Angeles, Calif.	7" Astrograph
Alika Herring	Tucson, Ariz.	6" Refl.
Lewiss Bartha		
S. Sarkadi-Nagy	Budapest, Hungary	4" & 8" Refrs.
T. Jager		
Rev. Kenneth J. Delano	New Bedford, Mass.	2"
Amateur Astronomers Association	New York, N.Y.	Various Instruments
Jack Eastman	Manhattan Beach, Calif.	12½" Refl.
Dennis Milon	Houston, Texas	8" Refl.
Walter Haas	Edinburg, Texas	6" Refl.
Suncrest Moonwatch Team	St. Petersburg, Fla.	Various Instruments
Allen Montague	Oak Park, Ill.	6" Refl.
David Williams	Normal, Ill.	35mm. Camera, Binoculars
Gordon Solberg	Las Cruces, New Mexico	6" Refl.
José Olivarez	Mission, Texas	2.4" Refr.
Craig L. Johnson	Boulder, Colo.	Astrocamera, 45mm. Refl.
George W. Rippen	Madison, Wisc.	6" Refl.
William Haney	San Jose, Calif.	Binoculars
D. Meisel	Delaware, Ohio	6" Refl., 32" Refl., 50mm. Refr.
Jerry Thrasher		
Rodney Norden	Norfolk, Va.	4½" Refl.
Clark Chapman	Buffalo, N.Y.	Binoculars, 10" Refl.
Fred Wyburn	Red Bluff. Calif.	Eye, 7 x 50 Monocular
Phillip Budine	Binghamton, N.Y.	4" Refr.
William O. Roberts	Alameda, Calif.	5" Refr. Binoculars

Comet Ikeya - List of Observers

C. F. Capen J. W. Young	Wrightwood, Calif.	16" Refl.
D. Meisel	Columbus, Ohio	50mm. Refr., 8" Refl.
Dennis Milon	Houston, Texas	Binoculars, 8" Refl.
Samuel Whitby	Brodnax, Va.	3" Refl.
R. B. Minton	El Paso, Texas	4" Astrocamera
John Ahearn	Brooklyn, N.Y.	Binoculars
Rodrigo de la Vega Letelier	Santiago, Chile	Various Instruments
Allen C. Montague	Oak Park, Ill.	Binoculars
Larry Anthenien	San Jose, Calif.	6" Refl.
Gordon Solberg	Las Cruces, N.M.	120mm. Refr.,Binoculars
Jean Nicolini A. P. Martins	São Paulo, Brazil	Various Instruments
John Bortle	Mt. Vernon, N.Y.	2.4" Refr., Binoculars

Comet Alcock 1963b - List of Observers

C. F. Capen		
J. W. Young	Wrightwood, Calif.	135mm. Telphoto
D. Meisel	Columbus, Ohio	8" Refl.
Clark Chapman	Buffalo, N.Y.	10" Refl.
W. O. Roberts	Alameda, Calif.	5" Refr.
A. P. Martins		
Jean Nicolini	São Paulo, Brazil	Various Instruments
William Westbrooke	San Francisco, Calif.	Binoculars
Gordon Solberg	Las Cruces, N.M.	Various Instruments
Dennis Milon	Houston, Texas	8" Refl.
George Rippen	Madison, Wisc.	6" Refl.
Rodney Norden	Norfolk, Va.	8" Refl.
José Olivarez	Mission, Texas	8" Refl.

The following orbital elements were adopted for the reduction of the data received:

Comet Humason

T = Dec. 10.3077, 1962 E.T.
ω = 233°.6187
☊ = 154°.7388 } 1950.0
i = 153°.2822
q = 2.131817 A.U.
e = 0.989519
1/a = + 0.0049165
P = 2900 yrs

B. G. Marsden
Ref. I.A.U. Circ. 1798

Comet Ikeya

T = March 21.3145, 1963 E.T.
ω = 335°.8843
☊ = 52°.4410 } 1950.0
i = 160°.6117
q = 0.633745
e = 1.000000

B. G. Marsden
Ref. I.A.U. Circ. 1821

Comet Seki-Lines

T = 1962 April 1.626 E.T.
ω = 11°.606
☊ = 303°.752 } 1950.0
i = 64°.612
e = 1.000000
q = 0.03123 A.U.

T. Seki
Ref. I.A.U. Circ. 1794

Comet Alcock 1963b*

T = 1963 May 6.040 E.T.
ω = 145°.859
☊ = 42°.873 } 1950.0
i = 86°.522
e = 1.000000
q = 1.55732 A.U.

B. G. Marsden
Ref. I.A.U. Circ. 1825

* A similar orbit for this comet was computed by A.L.P.O. member Michael Mc Cants and was published in the Harvard Announcement Cards as well as being circulated privately.

During June, 1963 Mr. Alcock announced the discovery of a second comet; but it turned out to be Comet Ikeya, which had brightened by several magnitudes after perihelion passage. Since, however, the object was located in the morning sky, few observations were received. Hence observers are encouraged to contribute any observations of this comet made after perihelion to the Recorder at once.

This concludes the first part of the 1962-63 report. The second and third parts will follow the same format as the report on Comet Burnham 1959k. Part II will give the quantitative data, and Part III will give a short discussion of the results.

VARIATIONS IN THE SOUTH EQUATORIAL AND NORTH EQUATORIAL BELTS OF JUPITER, 1941 - 1963

By: James C. Bartlett, Jr.

The following remarks are based entirely upon the writer's own observations for the period covered.

From 1941 through 1945 the South Equatorial Belt was very inconspicuous, while the North Equatorial Belt was very dark and prominent. In 1946 the same relation was usually maintained, though the SEB began to show signs of revival. In these years color was richly developed in the NEB and correspondingly lacking, with few exceptions, in the SEB, which appeared grayish.

The same conditions maintained for the first half of 1947; but by June 15 of that year the SEB had become much darker and was comparable in width to the NEB, which yet remained the darkest belt on Jupiter. Thereafter the SEB displayed periodic declines and revivals until July,1947, after which it became rather consistently equal to the NEB in width and intensity. The colors of the two belts were often different, though occasionally the same. By September, 1947, however, the NEB again was by far the darker, and the SEB had become fainter and grayish.

In 1948 there began a great revival of the SEB, with the development of a strong SEB_s; and by May-June of that year the two SEB components were as dark and conspicuous as the NEB. It is important to notice too that following these developments the color of the SEB and the NEB was most often the same, and that changes of color in one of these two belts were followed by simultaneous changes in the other belt. By July of 1948 the SEB_n - SEB_s complex had become the most conspicuous belt on the planet, and a month later the NEB had become much reduced in width. The SEB continued to dominate to the end of 1948, the NEB remaining much narrower. Intensity and color in both belts, however, remained the same; i.e., both were consistently of the same color, and both were of the same intensity or darkness.

In 1949, however, the NEB suddenly regained predominance. (That was the year of great duskiness in the EZ - remember?) As the SEB began to fade, its color was no longer the same as in the NEB. By late June of 1949 the fainter SEB was usually grayish, with occasional brownish tones, while the stronger NEB displayed vivid brown to red-brown tones. These conditions maintained until late October, when the SEB had a brief revival and for a time was not only as dark as the NEB but was again the same color. [However, E. J. Reese usually recorded the SEB_n to be orange in 1949. - Editor]

In 1950 the writer had too few observations to allow a significant determination; but through 1951 and 1952 the SEB was very faint, grayish, and sometimes virtually non-existent. During the same years the NEB was, or rather remained, very dark and richly colored - generally brown to red-brown.

The writer has no record for 1953; but in 1954 there began another revival of the SEB which often, though not always, became as wide and as dark as the NEB. It is interesting to note that during such periods of equality the colors of the two belts were the same.

The year 1955 saw another marked decline in the intensity and chroma of the SEB, which became faint and grayish; the NEB meanwhile remained very dark and richly colored. In May,1955, however, the SEB began to revive and by May 16 had become as broad and very nearly as dark as the NEB; by May 31 the two belts were of equal intensity and were very nearly the same color.

In 1956 the SEB gradually overtook the NEB in intensity, and by April 9 of that year had become the darker of the two and also the broader. Thereafter, through June, 1956, the two belts varied only slightly in relative intensity and usually were of the same color.

By 1957 the SEB had again suffered an abrupt decline and throughout that year remained very faint, grayish, and virtually invisible on some occasions. The NEB remained very dark and richly colored.

These conditions continued until May, 1958, when the SEB experienced a brief revival but remained inferior to the NEB in intensity. Thereafter there were repeated fadings and darkenings of the SEB, the NEB consistently remaining the darker, until late August, when a strong revival of the SEB began. After some intermittent fadings and revivals, the SEB by September 4 was the same intensity as the NEB, showed the same red-brown color, and was somewhat the wider. For the remainder of 1958 the two belts were usually of equal intensity, though varying in width.

Throughout 1959 the SEB remained conspicuous and very nearly as dark as the NEB, though exhibiting marked variations in width. Usually the two belts were the same color, and after June 20 a change in color of one belt was accompanied by a simultaneous change to the same color in the other. Not until September 3, 1959 did the SEB show a different color; and on that date the difference was one of degree rather than of kind. Thereafter and for the remainder of the 1959 apparition, both belts varied between red-brown and brown; and both varied in the same way.

The year 1960 saw a marked reduction in the width of the NEB, which became more comparable in this respect to the SEB. The latter belt remained strong and usually of the same color as the NEB, though with occasional fadings and loss of color. Throughout 1960, however, the NEB was usually a shade darker than the SEB.

In 1961 the NEB regained its width; and the SEB remained usually comparable, though with occasional fadings and reductions in width. By October both belts had become wider; they were about equal in intensity, and both displayed the same color. This status was a prelude to the extraordinary development of both belts in 1962, when on some occasions the SEB-NEB complex formed virtually one immense belt blanketing the tropical and equatorial regions of Jupiter.

In 1962 and up to September,1963, the dominant fact has been the identity in color and intensity of the two belts, and the sympathetic response to change which has extended to changes in texture as well as in color. This relation is very difficult to understand if we suppose that changes in the belts are caused entirely by local agencies.

Several facts emerge from this brief survey. The first fact is that changes in intensity, color, and width as between the SEB and the NEB have chiefly been changes in the SEB. The corollary is that, for the period discussed, the NEB has been the more stable of the two. The second fact is that the agency which gives rise to the two belts has exhibited a rather consistent activity for the NEB and a much more intermittent activity for the SEB. The third - and most puzzling - fact is that, notwithstanding this manifest difference, during those periods when the two belts were of equal or nearly equal intensity, both exhibited the same color and both exhibited the phenomenon of sympathetic change, as if both arose from a single agency and hence responded in the same way to any change of activity in the underlying cause. Yet they lie on opposite sides of the planet's equator.

A fundamental difficulty in explaining the observed facts lies in our lack of understanding of the nature of the belts. That they are not formed by ordinary meteorological processes appears clear; their strong coloration would alone establish this. Moreover, their observed renewals after fadings strongly suggest a renewal of activity in the responsible source or sources. This surmise, along with their strong colors, would suggest a volcanic or quasi-volcanic nature for the sources. On this view the material of the belts would consist of finely divided volcanic debris thrown up from volcanic sources. As this material gradually settles,the belts fade and lose color. Resumed activity at the sources then accounts for renewed darkening, broadening, and increased coloration in the belts. This hypothesis, however, does not agree well with the phenomenon of sympathetic change. It is difficult to imagine separate volcanic sources on both sides of the equator acting in such close concert to cause the same changes in color and at the same time, presumably requiring the same nature for the ejecta. [E. J. Reese points out that we do have the example of sunspot activity waxing and waning more or less in unison in the north and south hemispheres of the sun.]

The only plausible agency which would be simultaneously common to both of these two major belts must be the sun. Variations in its radiation (not necessarily in visible light) would, if they had any effect, produce like effects in both belts at the same time. Despite the difficulty with the inverse square law, our ignorance of the nature of the materials in the belts precludes any dogmatic conclusions about possible solar effects at the distance of Jupiter. Moreover, it is now usually agreed that the radius of certain solar effects is much greater than was previously thought, some authorities even speaking of the earth as being within the outer limits of the sun's atmosphere.

This observer must confess to being ignorant of the true nature of the Jovian processes, but within the limitations of that ignorance the following suggestions seem plausible:

The SEB and the NEB are intermittently renewed from below and may be regarded as formed of the ejecta from volcanic or quasi-volcanic sources. The presumed volcanic sources do not normally act in concert; nor do they display the same energy, thus causing the observed differences in intensity between the SEB and NEB. Moreover, the source or sources for one belt may be dormant at the time when the source or sources for the other belt are most active, thus explaining the virtual disappearance of one belt while the other remains strongly developed. Occasionally activity peaks in both sources occur simultaneously. At such times both belts display more or less equal intensity and show more or less the same colors. Sympathetic effects may also arise from a common agency different from the volcanic activity which gives rise to the belts themselves. Ergo, it may be an external source: the sun.

In conclusion it is believed by this writer that the observed phenomena of the two great equatorial belts of Jupiter may be explained by a combination of Jovian volcanic causes and solar influences.

<u>Postscript by Editor</u>. The interest and value of Dr. Bartlett's treatment of his observations are greatly enhanced by the fact that we have here a homogeneous series of data by one observer extending over a period of 22 years. The observer is to be very highly commended for his remarkable diligence and perseverance. Apertures which he employed were only three to five inches. Dr. Bartlett's project should surely be an inspiring example to possessors of small apertures in showing what can be achieved with planning, carefulness, and real devotion. Perhaps some articles in recent issues of this magazine have stressed too much the limitations of small apertures.

This article was reviewed before publication by Jupiter Recorders P. R. Glaser and E. J. Reese, and most of the suggestions which they made were adopted.

COMPUTING THE CENTRAL MERIDIAN OF JUPITER

By: Walter H. Haas

Jupiter is properly a favorite object with amateur planetary observers. The rapid rotation of the planet adds much interest to its study and enables us to set up a system of Jovian latitude and longitude, in principle the same as on the earth. Very early in our studies of the Giant Planet we recognize the need of learning to compute what Joviàn longitude is presented to view. In practice one finds the central meridian of longitude, which is that meridian determined by the center of the illuminated disc and by the earth-turned

EPHEMERIS FOR PHYSICAL OBSERVATIONS

LONGITUDE OF CENTRAL MERIDIAN OF ILLUMINATED DISK

SYSTEM I

Day (0ʰ U.T.)	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
	°	°	°	°	°	°	°	°	°	°	°	°
1	23.4	231.9	123.9	330.8	20.4	228.8	281.3	133.4	347.9	46.8	265.6	326.3
2	181.1	29.6	281.5	128.4	178.0	26.6	79.0	291.3	145.8	204.8	63.6	124.2
3	338.8	187.3	79.2	286.0	335.7	184.3	236.8	89.1	303.7	2.8	221.7	282.2
4	136.6	344.9	236.8	83.7	133.4	342.0	34.6	247.0	101.7	160.8	19.7	80.2
5	294.3	142.6	34.4	241.3	291.1	139.7	192.4	44.8	259.6	318.8	177.7	238.2
6	92.0	300.3	192.1	39.0	88.7	297.5	350.2	202.7	57.5	116.8	335.8	36.1
7	249.7	97.9	349.7	196.6	246.4	95.2	148.0	0.5	215.5	274.8	133.8	194.1
8	47.4	255.6	147.4	354.3	44.1	252.9	305.8	158.4	13.4	72.8	291.9	352.0
9	205.1	53.2	305.0	151.9	201.8	50.6	103.5	316.3	171.4	230.9	89.9	150.0
10	2.9	210.9	102.6	309.6	359.4	208.4	261.3	114.1	329.3	28.9	247.9	308.0
11	160.6	8.6	260.3	107.2	157.1	6.1	59.1	272.0	127.3	186.9	46.0	105.9
12	318.3	166.2	57.9	264.9	314.8	163.9	216.9	69.9	285.2	344.9	204.0	263.8
13	116.0	323.9	215.6	62.5	112.5	321.6	14.7	227.8	83.2	142.9	2.0	61.8
14	273.7	121.5	13.2	220.2	270.2	119.3	172.5	25.6	241.1	301.0	160.1	219.7
15	71.4	279.2	170.8	17.8	67.9	277.1	330.4	183.5	39.1	99.0	318.1	17.6
16	229.1	76.8	328.5	175.5	225.6	74.8	128.2	341.4	197.1	257.0	116.1	175.6
17	26.8	234.5	126.1	333.1	23.3	232.6	286.0	139.3	355.0	55.0	274.2	333.5
18	184.4	32.1	283.8	130.8	181.0	30.3	83.8	297.2	153.0	213.1	72.2	131.4
19	342.1	189.8	81.4	288.4	338.6	188.1	241.6	95.1	311.0	11.1	230.2	289.3
20	139.8	347.4	239.0	86.1	136.3	345.8	39.4	253.0	108.9	169.1	28.2	87.2
21	297.5	145.1	36.7	243.7	294.0	143.6	197.2	50.9	266.9	327.2	186.3	245.1
22	95.2	302.7	194.3	41.4	91.7	301.3	355.1	208.8	64.9	125.2	344.3	43.0
23	252.9	100.4	352.0	199.1	249.4	99.1	152.9	6.7	222.9	283.2	142.3	200.9
24	50.6	258.0	149.6	356.7	47.1	256.9	310.7	164.6	20.8	81.3	300.3	358.8
25	208.2	55.7	307.3	154.4	204.9	54.6	108.5	322.5	178.8	239.3	98.3	156.7
26	5.9	213.3	104.9	312.0	2.6	212.4	266.4	120.4	336.8	37.3	256.3	314.6
27	163.6	10.9	262.5	109.7	160.3	10.2	64.2	278.3	134.8	195.4	54.3	112.5
28	321.3	168.6	60.2	267.4	318.0	167.9	222.0	76.2	292.8	353.4	212.3	270.3
29	118.9	326.2	217.8	65.0	115.7	325.7	19.9	234.1	90.8	151.5	10.3	68.2
30	276.6		15.5	222.7	273.4	123.5	177.7	32.0	248.8	309.5	168.3	226.1
31	74.3		173.1		71.1		335.6	190.0		107.5		23.9

MOTION OF THE CENTRAL MERIDIAN

	0ʰ	1ʰ	2ʰ	3ʰ	4ʰ	5ʰ	6ʰ	7ʰ	8ʰ	9ʰ	10ʰ	11ʰ
m	°	°	°	°	°	°	°	°	°	°	°	°
0	0.0	36.6	73.2	109.7	146.3	182.9	219.5	256.1	292.7	329.2	5.8	42.4
5	3.0	39.6	76.2	112.8	149.4	186.0	222.5	259.1	295.7	332.3	8.9	45.4
10	6.1	42.7	79.3	115.8	152.4	189.0	225.6	262.2	298.7	335.3	11.9	48.5
15	9.1	45.7	82.3	118.9	155.5	192.1	228.6	265.2	301.8	338.4	15.0	51.5
20	12.2	48.8	85.4	121.9	158.5	195.1	231.7	268.3	304.8	341.4	18.0	54.6
25	15.2	51.8	88.4	125.0	161.6	198.1	234.7	271.3	307.9	344.5	21.1	57.6
30	18.3	54.9	91.5	128.0	164.6	201.2	237.8	274.4	310.9	347.5	24.1	60.7
35	21.3	57.9	94.5	131.1	167.7	204.2	240.8	277.4	314.0	350.6	27.2	63.7
40	24.4	61.0	97.6	134.1	170.7	207.3	243.9	280.5	317.0	353.6	30.2	66.8
45	27.4	64.0	100.6	137.2	173.8	210.3	246.9	283.5	320.1	356.7	33.2	69.8
50	30.5	67.1	103.6	140.2	176.8	213.4	250.0	286.6	323.1	359.7	36.3	72.9
55	33.5	70.1	106.7	143.3	179.9	216.4	253.0	289.6	326.2	2.8	39.3	75.9
60	36.6	73.2	109.7	146.3	182.9	219.5	256.1	292.7	329.2	5.8	42.4	79.0

FIGURE 12. The central meridian of Jupiter in System I in 1964. Original table in the 1964 American Ephemeris and Nautical Almanac. Prepared for publication in this journal by Mr. Philip Glaser. The use of this table and of the similar one in Figure 13 is discussed in the article "Computing the Central Meridian of Jupiter".

JUPITER, 1964 335

EPHEMERIS FOR PHYSICAL OBSERVATIONS

LONGITUDE OF CENTRAL MERIDIAN OF ILLUMINATED DISK

SYSTEM II

Day (0^h U.T.)	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
	°	°	°	°	°	°	°	°	°	°	°	°
1	250.5	222.6	253.3	223.6	44.3	16.3	199.8	175.4	153.3	343.3	325.5	157.3
2	40.6	12.6	43.3	13.6	194.4	166.4	349.9	325.6	303.6	133.7	116.0	307.7
3	190.7	162.7	193.3	163.6	344.4	316.5	140.1	115.8	93.9	284.0	266.4	98.0
4	340.8	312.7	343.3	313.7	134.5	106.5	290.2	266.1	244.2	74.4	56.8	248.4
5	130.9	102.7	133.3	103.7	284.5	256.6	80.4	56.3	34.5	224.8	207.2	38.7
6	281.0	252.8	283.3	253.7	74.5	46.7	230.5	206.5	184.8	15.2	357.6	189.0
7	71.1	42.8	73.3	43.7	224.6	196.8	20.7	356.7	335.1	165.5	148.0	339.4
8	221.2	192.8	223.3	193.7	14.6	346.9	170.9	147.0	125.4	315.9	298.4	129.7
9	11.3	342.8	13.4	343.7	164.7	137.0	321.0	297.2	275.7	106.3	88.8	280.0
10	161.3	132.9	163.4	133.8	314.7	287.1	111.2	87.4	66.1	256.7	239.2	70.3
11	311.4	282.9	313.4	283.8	104.8	77.2	261.4	237.7	216.4	47.1	29.6	220.7
12	101.5	72.9	103.4	73.8	254.8	227.4	51.5	27.9	6.7	197.5	180.0	11.0
13	251.6	222.9	253.4	223.8	44.9	17.5	201.7	178.2	157.0	347.9	330.4	161.3
14	41.6	13.0	43.4	13.8	195.0	167.6	351.9	328.4	307.4	138.3	120.9	311.6
15	191.7	163.0	193.4	163.9	345.0	317.7	142.0	118.7	97.7	288.7	271.3	101.9
16	341.8	313.0	343.4	313.9	135.1	107.8	292.2	268.9	248.0	79.1	61.7	252.2
17	131.8	103.0	133.4	103.9	285.1	257.9	82.4	59.2	38.3	229.5	212.1	42.5
18	281.9	253.1	283.4	253.9	75.2	48.0	232.6	209.4	188.7	19.8	2.4	192.8
19	72.0	43.1	73.5	44.0	225.3	198.2	22.8	359.7	339.0	170.3	152.8	343.0
20	222.0	193.1	223.5	194.0	15.3	348.3	173.0	149.9	129.4	320.7	303.2	133.3
21	12.1	343.1	13.5	344.0	165.4	138.4	323.1	300.2	279.7	111.1	93.6	283.6
22	162.1	133.1	163.5	134.0	315.5	288.5	113.3	90.5	70.1	261.5	244.0	73.9
23	312.2	283.1	313.5	284.1	105.5	78.7	263.5	240.8	220.4	51.9	34.4	224.1
24	102.2	73.2	103.5	74.1	255.6	228.8	53.7	31.0	10.8	202.3	184.8	14.4
25	252.3	223.2	253.5	224.1	45.7	18.9	203.9	181.3	161.1	352.7	335.1	164.7
26	42.3	13.2	43.5	14.2	195.8	169.1	354.1	331.6	311.5	143.1	125.5	314.9
27	192.4	163.2	193.6	164.2	345.9	319.2	144.3	121.9	101.8	293.5	275.9	105.2
28	342.4	313.2	343.6	314.2	135.9	109.3	294.5	272.1	252.2	83.9	66.2	255.4
29	132.5	103.2	133.6	104.3	286.0	259.5	84.8	62.4	42.6	234.3	216.6	45.7
30	282.5		283.6	254.3	76.1	49.6	235.0	212.7	192.9	24.7	7.0	195.9
31	72.5		73.6		226.2		25.2	3.0		175.1		346.1

MOTION OF THE CENTRAL MERIDIAN

	0^h	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h
m	°	°	°	°	°	°	°	°	°	°	°	°
0	0.0	36.3	72.5	108.8	145.1	181.3	217.6	253.8	290.1	326.4	2.6	38.9
5	3.0	39.3	75.5	111.8	148.1	184.3	220.6	256.9	293.1	329.4	5.7	41.9
10	6.0	42.3	78.6	114.8	151.1	187.4	223.6	259.9	296.1	332.4	8.7	44.9
15	9.1	45.3	81.6	117.9	154.1	190.4	226.6	262.9	299.2	335.4	11.7	48.0
20	12.1	48.4	84.6	120.9	157.1	193.4	229.7	265.9	302.2	338.5	14.7	51.0
25	15.1	51.4	87.6	123.9	160.2	196.4	232.7	268.9	305.2	341.5	17.7	54.0
30	18.1	54.4	90.7	126.9	163.2	199.4	235.7	272.0	308.2	344.5	20.8	57.0
35	21.2	57.4	93.7	129.9	166.2	202.5	238.7	275.0	311.3	347.5	23.8	60.0
40	24.2	60.4	96.7	133.0	169.2	205.5	241.8	278.0	314.3	350.5	26.8	63.1
45	27.2	63.5	99.7	136.0	172.2	208.5	244.8	281.0	317.3	353.6	29.8	66.1
50	30.2	66.5	102.7	139.0	175.3	211.5	247.8	284.1	320.3	356.6	32.8	69.1
55	33.2	69.5	105.8	142.0	178.3	214.6	250.8	287.1	323.3	359.6	35.9	72.1
60	36.3	72.5	108.8	145.1	181.3	217.6	253.8	290.1	326.4	2.6	38.9	75.1

FIGURE 13. The central meridian of Jupiter in System II in 1964. Original table in the 1964 American Ephemeris and Nautical Almanac. Prepared for publication in this journal by Mr. Philip Glaser.

pole of rotation. The central meridian may be loosely thought of as a line bisecting Jupiter between its east and west limbs, where east and west are established by the rotation of the planet and are not directions in the earth's sky.

Jupiter lacks permanent features with constant periods of rotation. We have no reference points like Greenwich on earth or the Dawes Forked Bay on Mars. Thus the period of rotation of Jupiter is an arbitrary value, though it is convenient to pick a number close to the periods of many actual surface features; and the zero meridian of longitude is likewise arbitrary. In actuality, optical observers have found it convenient to define two periods of rotation, System I of about 9 hrs., 50 mins., 30 secs. and System II of about 9 hrs., 55 mins., 41 secs. Though some exceptions occur, System I usually applies to features located in low Jovian latitudes, between the south edge of the North Equatorial Belt and the north edge of the South Equatorial Belt, inclusive; System II then usually applies to the rest of Jupiter.

To compute the central meridian of Jupiter in either System for a particular date and time it will be sufficient to have two tables, one giving the central meridian at selected dates and/or times and the second giving the change in longitude corresponding to selected time intervals. In the 1964 American Ephemeris and Nautical Almanac the two tables are conveniently presented together. On pg. 334 there is given the central meridian of Jupiter at 0 hrs., Universal Time in System I for each day in 1964 and, under "Motion of the Central Meridian", a table of values to be added to the 0 hrs. longitude to obtain the central meridian in System I at any time whatever. On pg. 335 there is the same information for System II. These two pages from the Ephemeris are reproduced in this issue as Figures 12 (pg. 238) and 13 (pg. 239). They were kindly prepared in a format suitable for publication here by Mr. Philip R. Glaser, the A.L.P.O. Jupiter Recorder.

The use of Universal Time may be worth a few words. We cannot tolerate the vagaries of different zone times, still less the absurdities of Daylight Saving Times, in reducing observations from all parts of the United States and also many foreign countries. The astronomical standard is Universal Time, the local mean solar time at Greenwich (longitude zero degrees). Universal Time is in a 24-hr. system beginning at midnight. To obtain Universal Time, add five hours to E.S.T., six hours to C.S.T., seven hours to M.S.T., and eight hours to P.S.T. The local zone time must be further increased by 12 hours when it is P.M. (unchanged when A.M.). The process is reversed when returning from U.T. to a local zone time. In the United States the Universal Time date is sometimes one day later than the local date.

Some examples should make clear the use of the tables in Figures 12 and 13.

1. An observer times a projection on the south edge of the North Equatorial Belt to transit the central meridian at 8:15 P.M. on January 19, 1964 by E.S.T. What is its longitude?

The U.T. is 1 hr., 15 mins. on January 20. The latitudinal location implies motion in System I (Figure 12). Thus:

Long. in I at 0 hrs., Jan. 20, 1964	139°.8
Motion in 1 hr.	36.6
Motion in 15 mins.	9.1
Longitude (I)	185°.5

The result would usually be rounded to 186°.

2. An observer employing C.S.T. makes a drawing of Jupiter at 3:38 A.M. on August 11, 1964. What is the C.M. in System II?

The U.T. is 9 hrs., 38 mins. on August 11. We use Figure 13 for our data.

Long. in II at 0 hrs., August 11, 1964	237°.7
Motion in 9 hrs.	326.4
Motion in 35 mins.	21.2
Motion in 3 mins. (3/5 of 3.0)	1.8
Longitude (II)	587°.1
Subtracting 360°, we get	227°.

3. If the Great Red Spot is at longitude 17° (II), when may it be observed on June 16, 1964?

System II again implies Figure 13. We add 360° to the Red Spot longitude in order to subtract easily.

Long. of Red Spot	377°.0
Long. in II at 0 hrs., June 16, 1964	107.8
Required motion in System II	269°.2

We now use the "Motion of the Central Meridian" in Figure 13 in reverse to determine how long Jupiter will require to rotate through the known amount of longitude (II).

Motion in 7 hrs.	253°.8
Motion in 25 mins.	15.1
Motion in 1 min. (1/5 of 3.0)	0.6
Motion in 7 hrs., 26 mins.	269°.5

Thus the Red Spot will transit the C.M. at 7 hrs., 26 mins., U.T. on June 16. The observer will still need to assure himself, of course, that Jupiter is indeed observable at this time, being above his horizon on a dark enough sky. He may want to convert to a zone time; e.g., the P.S.T. would be 11:26 P.M. on June 15. Further transit times on and near June 16 can be obtained by adding or subtracting multiples of the System II period of rotation, namely, 9 hrs., 55.7 mins.

AN OBSERVATION OF THE SOUTHWEST INNER WALL (IAU SENSE) OF ARISTARCHUS

By: Harry D. Jamieson, A.L.P.O. Lunar Recorder

The drawing to which the following description applies is reproduced as Figure 14. All Greek letters in the text refer to objects on Figure 14. The region studied might even be called Aristarchus-Herodotus Eruption Point Number Three, for it is a lunar site where Lowell Observatory observers recorded red colors on October 30 and November 28, 1963. The author invites other observers to make a critical study of this portion of the Aristarchus wall, particularly those equipped with larger apertures.

Alpha. Xi: -.6820, Eta: + .3950.

This refers to the small craterlet just inside the (IAU directions here and later) SW wall of Aristarchus, which I will call alpha. Its diameter appears to be about 4½kms. at the major axis;and under a solar elevation angle of +09° 46', I estimated that its depth could not exceed 250 meters at its center (the shadow did not extend to center, but to the point that it did reach I measured the depth as being 200 meters.) A narrow, faint, and more or less diffuse dark band was seen to run from alpha's ESE wall down toward the floor of Aristarchus (see also epsilon), while at the crater's SE wall could be seen a very strange gorge or valley (see gamma). No details within alpha could be made out.

Beta. Xi: - .6805, Eta: + .3930

This pertains to the elongated bright spot just SSE of alpha. At

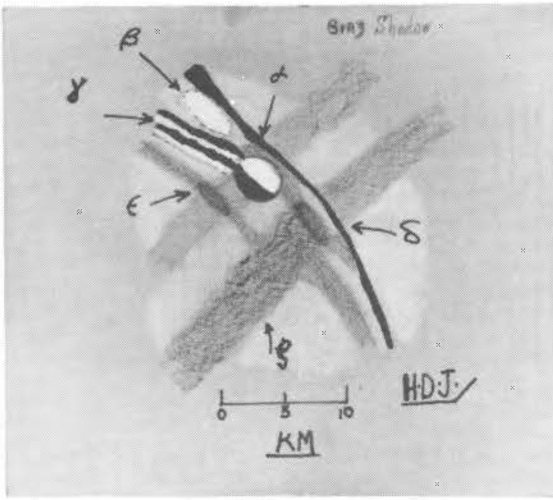


FIGURE 14. Drawing of portion of southwest (IAU sense) inner wall of Aristarchus by Harry D. Jamieson. 10-inch reflector. 313X, 660X (both with Barlow). December 28, 1963. $2^h\ 39^m$ - $2^h\ 55^m$, U.T. Seeing 4 - 6 (variable). Transparency 5.5. Colongitude $58^{\circ}.5$. Lunar south at top, lunar east (IAU) at left. The six features with Greek letters are described in the text.

x660, small dark objects of uncertain number, size, or exact location were seen within the spot - but other than that, no other features of interest are to be found near or on beta. It is mentioned here because of its brightness and the fact that it lies just SSW of our next feature of interest, gamma.

Gamma. Xi: - .6805, Eta: + .3940

A most peculiar object, appearing from its shadow pattern to be a depressed area with raised walls - perhaps a gorge or valley. It runs SE from the wall of alpha and cannot have a depth exceeding 100 - 150 meters where it is included in the drawing. Under x660, much detail could be seen inside - but could not be captured because of the quite variable seeing conditions. There was a distinct impression given from the appearance of the object that it may indeed be more of a crater-chain than a gorge or valley - but this will have to await further observation for confirmation. It could not be told whether or not gamma in any way intruded into the SE wall of alpha because of the lighting conditions. I feel that this would be quite likely, however, and suggest that further observations would be of value in determining whether it does.

Delta. Xi: - .6830, Eta: + .3970

A dusky-dark spot at the junction of dark-band "A" (by Robinson) and another dark object, which appeared to be either another dusky band or a terrace casting a gray grazing shadow. Not much of interest here, except that the spot appeared mottled under good seeing and high power. A small, triangular dusky area of lighter shade was found between delta and the rim of Aristarchus.

Epsilon. Xi: - .6800, Eta: + .3950

A slightly lighter edition of delta, also appearing mottled under high power.

Zeta. Extended object.

This object is called "A" by Robinson in his paper "Contributions to Selenography - Part I" (Str. A., 16, 1-2, pp. 31-35) and is, since I have actually paid it little attention in the past, better described there than I could here. I did not notice its double appearance, as shown in Fig. 42 of Mr. Robinson's paper. See also his drawing on the front cover of the aforementioned issue of The Strolling Astronomer.

BOOK REVIEWS

Pictorial Guide to the Moon, by Dinsmore Alter. 135 photographs and drawings, 183 pages. The Crowell Company, 1963. $6.95

Reviewed by Alika Herring

The author of this excellent book on the moon was for many years the Director of the Griffith Observatory and Planetarium in Los Angeles, and has had long experience in presenting scientific topics to the public in lucid form. He was one of the few professional astronomers to study the moon intensively previous to the last decade, and Pictorial Guide to the Moon is primarily the result of his studies. It is based for the most part on a series of papers that were published previously in The Griffith Observer, Publications of the Astronomical Society of the Pacific, and Introduction to the Moon, the modest predecessor to the present work. These papers have been revised, and much new material has been added. In keeping with its title, Pictorial Guide to the Moon is profusely illustrated, and contains numerous drawings as well as a large number of photographs. While many of these photographs are from the famous Lick series by Chappell and Moore, others are from the Mount Wilson and Palomar Observatories; and many of these latter photographs were taken by the author himself. These photographs have been handled well by the photo-engraver, and the general quality of the reproductions is excellent.

The book covers a wide variety of topics related to the moon, beginning with the early history of lunar observation and extending to the time in the not too distant future when man will actually occupy the moon and begin to utilize its scientific possibilities. In addition to these generalized subjects, the author devotes several chapters to a discussion of the physical characteristics of the surface features. The discussion on the nature of such little studied features as the lunar rays and domes is particularly interesting. Also of current interest is a chapter on the probable emission of gases from the lunar interior; and while this material for the most part is a reiteration of the work previously done on Alphonsus by the author and Kozyrev, it assumes added significance in view of the recent observation of apparent activity near Aristarchus. The final chapter in the book, in which the author outlines the great advantages a moon-based observatory will have, is particularly timely.

The preface to the book states that its primary purpose is to "provide to the public that information which they must secure if the space plans to which our government is committed are to obtain successful results". A second purpose is to bring to the attention of lunar students many of the basic problems in selenology that still await solution. A third purpose, certainly implied if not written, is simply to make a timely and thought-provoking discussion of our satellite available to layman and scientist alike. Pictorial Guide to the Moon scores well on all counts.

A Survey of the Moon, by Patrick Moore. W. W. Norton & Company, Inc., New York, 1963. pp. xiv + 333. Clothbound. $6.95.

Reviewed by John E. Westfall, ALPO Lunar Recorder

A Survey of the Moon is a revised and much-expanded version of the author's earlier A Guide to the Moon. Much has taken place in selenography in the ten years between the two books, and the newer book has been updated to 1962. This book is clearly intended for the amateur astronomer who is not a lunar expert, but it should also be enjoyable and profitable reading for the intelligent layman and for the advanced amateur. Mr. Moore has the happy ability to convey large amounts of information in a clear, straightforward style. Mathematics is avoided.

Lunarians familiar with A Guide to the Moon will be interested in comparing the newer book with the older. The general outline of both is the same. The "Lunar Landscapes" chapter has been deleted, but most of its material appears in the new chapter 17, "Into the Future".

Among the new material is a brief discussion of tektites (pp. 47-50), which is informative, although some will argue that a volcanic, rather than a meteoritic, origin for tektites is carrying the volcanic theory too far! Throughout the book, Mr. Moore argues that vulcanism is the basic process behind the lunar surface formations, in particular the craters (to which a separate chapter is now devoted). Many will disagree with this view. The point is certainly debatable, but Mr. Moore has shown a commendably scientific spirit throughout; he presents both sides of the question and always warns the reader when he leaves facts for speculation.

A new chapter, "The Other Side of the Moon", contains an informative discussion of the famous Lunik III photographs, two of which are reproduced, along with a photograph of a "back side" globe prepared from the Lunik photographs. Appendix V shows an orthographic map of the reverse hemisphere, together with a brief description of the major features photographed on the reverse hemisphere. The stated scale of the chart, 1:10,000,000, however, is incorrect; 1:32,000,000 is nearer the truth.

On the whole, the newer book is the better illustrated. Seven photographs from the Kwasan Observatory in Japan are reproduced. These are particularly valuable as they are quite sharp and detailed and yet not so overenlarged (as in most other lunar works) that the beginner finds himself "lost" when he studies them. Also reproduced are twelve of L. F. Ball's excellent lunar sketches, which should serve as an incentive towards better amateur lunar sketching.

The most valuable addition to this book is a medium-scale lunar map, in sixteen sections. Although not intended as an authority for the advanced observer, the map is quite useful as a guide. Surface features are shown in sufficient detail that the beginning observer should have no difficulty in locating even relatively unimportant features. Likewise, the written descriptions of individual formations are detailed enough to give the reader a clear idea of lunar topography without the lengthy, dry, and confusing descriptions found in more advanced works.

Criticisms of this book are few and are restricted to minor points. This writer was disappointed to see that "Observing the Moon" (Appendix I) was cut down to only four pages, although these are concise and informative pages. Perhaps the need for a more complete observing guide will be filled by Mr. Moore's forthcoming <u>Advanced Amateur Astronomy</u>; one wishes, however, that an otherwise thorough and informative lunar text would have included more adequate instructions for amateur observers. Colongitude, for instance, is not mentioned; at the very least, an indication of the approximate phase at which the features on each section of the map can be best observed would have been very useful.

The sectional maps and the textual maps are unfortunately in the "outline" style favored by Goodacre and Wilkins, which gives one a rather schematic picture of the moon which is often hard to interpret, especially when compared with actual views under varying illuminations.

The reader must be careful in following the nomenclature used in <u>A Survey of the Moon</u>; many of the names given for features are unofficial and do not appear on most other maps. Likewise, the author uses the classical system of lunar orientation throughout (south at the top, east at the right), but makes no mention of the newer IAU system, which may cause some confusion for future users of this book.

Those familiar with the history of American lunar studies will be disappointed by the scant coverage given to work in the United States. No mention is made of the excellent Moore-Chappell Lick series of lunar photographs. Also ignored are the several valuable lunar maps now produced by the U.S. Air Force, Army Map Service, and the Geological Survey.

The above deficiencies, although unfortunate, do not seriously detract from the value of the work. A Survey of the Moon is enthusiastically recommended to beginning and advanced lunar students.

Der Sternenhimmel 1964: Edited by Robert A. Naef, Aarau, Switzerland. H. R. Sauerländer & Co., 134 pgs. In German. Available in the United States from Albert J. Phiebig, P.O. Box 352, White Plains, New York.

Reviewed by Klaus R. Brasch

It is once again this reviewer's pleasant task to deal with this fine little Swiss astronomical handbook. As in previous years, this book meets with the highest standards in incorporating, in a clear and concise manner, as much astronomical information as possible.

Somewhat expanded this year, it includes, along with a brief daily presentation of astronomical events, detailed treatments of major celestial objects and special events. Almost every phase of amateur astronomy is touched, from the most elementary, such as a chart for finding the brightest stars, to more advanced aspects, including charts for several variable stars. Throughout the text are scattered attractive photographs of various objects of special interest, as well as informative diagrams as, for example, the orbital paths of the Perseid and Leonid meteor swarms.

Once more the major criticism of this book comes in connection with its binding, which is altogether too flimsy, easily falling apart under the frequent handling demanded of a book of this nature. With the above exception, however, Der Sternenhimmel deserves only the highest praise.

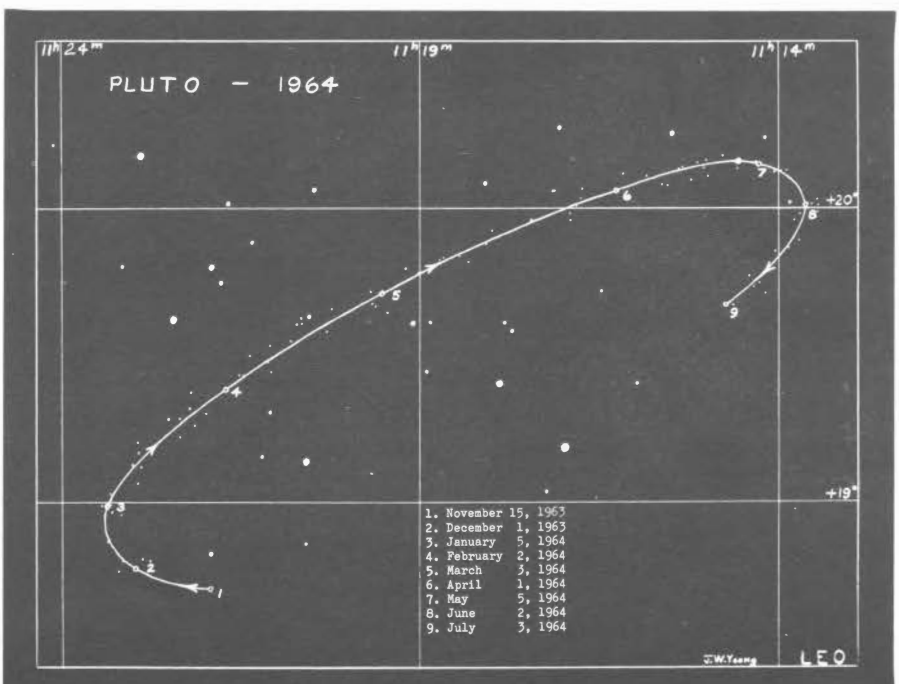


FIGURE 15. Chart of the apparent movement of Pluto among the stars, November, 1963 to July, 1964. North at top, west at right. The orientation is thus that of an erect view in middle northern latitudes with the planet on the meridian. Contributed by James W. Young.

PLUTO DURING 1964

By: James W. Young, Table Mountain Observatory

The finding chart here (Figure 15) should allow many amateurs to see Pluto for the first time, a six-inch refractor being adequate for the task with an optimum moonless sky. The planet's apparent visual magnitude is about 13.5. The chart is based upon the Palomar Sky Atlas and the astrometric positions given in The American Ephemeris and Nautical Almanac converted to apparent positions. Positional checks were made on an 18-inch Schmidt camera plate kindly taken by Mr. Charles Kowal at Palomar Observatory and also by visual observation with the 16-inch reflector at Table Mountain Observatory.

ANNOUNCEMENTS

Sustaining Members and Sponsors. As of April 13, 1964 there are in these new classes of membership:

Sponsors - W. O. Roberts, Jr., David P. Barcroft; Philip and Virginia Glaser; Charles H. Giffen; John E. Westfall; Joel W. Goodman; the National Amateur Astronomers, Inc.; James Q, Gant, Jr.; David and Carolyn Meisel; Clark R. Chapman.

Sustaining Members - Grace E. Fox; Ken Thomson; Sky Publishing Corporation; Joseph Ashbrook; Charles F. Capen; Kenneth J. Delano; Craig L. Johnson; Geoffrey Gaherty, Jr.; Dale P. Cruikshank; Charles L. Ricker; James W. Young; Charles M. Cyrus; Alan McClure; Elmer J. Reese.

Sustaining Members pay $10 per year; Sponsors, $25. Of these amounts, $4 pays for a subscription to this magazine; and the remainder is a gift to help support the work and activities of the A.L.P.O. We express our thanks to the donors listed above for their generous financial assistance.

Request for Photographs of Jupiter. Mr. Elmer J. Reese, Research Center, New Mexico State University, University Park, New Mexico wants to borrow photographs of Jupiter showing the Red Spot taken during either of these intervals: July 10, 1962 to July 31, 1962 and October 3, 1962 to October 14, 1962. The time of the photographs should be known to the nearest minute or better. It is Mr. Reese's intention to measure the position of the Red Spot on such photographs as part of an intense study of the motion of the Spot during the 1962-3 apparition of Jupiter. The Editor will appreciate any help of this kind which A.L.P.O. members are able to give to Mr. Reese.

Outline Lunar Forms Available. Mr. Clark R. Chapman, A.L.P.O. Lunar Recorder in charge of the Lunar Training Program, reminds readers that outline forms of Cassini, Posidonius, Guericke-Bonpland-Parry-Fra Mauro, and Aristarchus-Herodotus are still available. Advanced observers have found these forms very helpful, and several beginners have started to use them. New members and those who have not specialized in observing the moon are cordially invited to enrol in the Lunar Training Program. This project is specifically a training program, with opportunities for those who participate to learn techniques and procedures. Mr. Chapman's address is on the back inside cover of this issue.

Invitation to a Japanese Planetarium. Anticipating that some A.L.P.O. members will visit Japan to attend the Olympic Games in Tokyo in 1964, Mr. Takeshi Sato cordially invites such members to visit the Rakurakuen Planetarium in Hiroshima. His address is: Takeshi Sato, Rakurakuen Planetarium, Itsukaichi, Hiroshima, Japan. We thank Mr. Sato for this gracious invitation. We hope that some A.L.P.O. members can visit the Rakurakuen Planetarium, and in due time we should like to hear of their travels.

A.L.P.O. Observing Manual. An observing manual upon lunar and planetary programs suitable for amateurs has been discussed intermittently as an A.L.P.O. project for a number of years. Several colleagues have started to compile such a Manual but have later abandoned the effort. Perhaps the chief problems have been the great amount of time needed to carry out such a project properly, the intrinsic complexity of the task, and the difficulties in getting writing assignments done on time - or at all. The project was revived, however, in discussions during the 1963 A.L.P.O. Convention in San Diego, with - or so the Editor thinks - more realism than in past efforts. Dale P. Cruikshank and Clark R. Chapman are in charge of the new projected Manual. They will welcome useful ideas and constructive criticism from our members. A detailed outline has been prepared, many of the chapters have been assigned to qualified authors, and some of them have been written. Manual material will be criticized in detail by different qualified persons, and much rewriting is expected in order to make the final quality as good as possible. It is hoped that very considerable progress can be reported about the Manual in our meeting in Denver in August.

Tardiness of This Issue. The Editor apologizes for the extreme lateness of this issue of The Strolling Astronomer. Since the last issue was published, delays of many weeks have been created by the illness of both the Editor and of Mrs. Haas, who types the copy furnished to our publisher. We appreciate the patience of our readers and shall keep trying to reduce the gap between the calendar and the dates of publication.

The A.L.P.O. Story. Many of our readers will have seen Joel Goodman's article "Lunarians and Planetarians, Inc." in the April-May, 1964 number of The Review of Popular Astronomy. We express our thanks to Editor Don Zahner of R.P.A. and his staff for this fine, well illustrated coverage of our Association and its aims and objectives - and also by all means to author Goodman. The article includes a list of the names and addresses of all A.L.P.O. staff members. We recommend The Review of Popular Astronomy highly as a more elementary supplement to the long-famous Sky and Telescope. Beginners and amateur observers will find a wealth of information in its pages. Inquiries should be addressed to Sky Map Publications, Inc., P.O. Box 231, St. Louis 5, Missouri.

Second Nationwide Amateur Astronomers Convention and Twelfth A.L.P.O. Convention. This year's A.L.P.O. Convention will be part of a national, or rather international, amateur meeting at Denver, Colorado on the University of Denver campus on August 28-31, 1964. Participating societies are the Western Amateur Astronomers, the American Association of Variable Star Observers, the Astronomical League, the Royal Astronomical Society of Canada, and the A.L.P.O., with the University of Denver and the Denver Astronomical Society acting as hosts. Registration will cost $5.00 per single person or head of family plus 50 cents apiece for each additional family member. Accommodations will be available on the campus from the evening of August 27 to the night of August 31. On-campus registration begins on August 27. Dormitory rooms will be available, two persons per room, at a tentative rate of $3.50 per person. Meals will be available in dormitories. Those desiring off-campus accommodations should write for information to W. R. Van Nattan, 1591 S. Cherry St., Denver, Colorado 80222; he is in charge of registration and housing.

All authors contributing papers to the program must have the title, an abstract, and the estimated delivery time (at most 20 minutes) in the hands of A. R. Gassmann, 4330 So. Pennsylvania St., Englewood, Colo. by July 1, 1964. A copy of the complete paper in clear, readily reproducible form, including all illustrations, must be given to Mr. Gassmann at the time of the Convention for printing in the Proceedings. This copy must be typed, double spaced, and on only one side of the paper. All A.L.P.O. papers are to be submitted via Walter H. Haas, Box 26, University Park, New Mexico 88070. One copy of the Proceedings will be furnished to each basic $5.00 registrant.

Meeting space will be provided on request for business meetings of the various groups attending. Exhibits will surround the session room in the Student Union Building, an arrangement found very successful in 1959 with the first N.A.A.C. There will be both amateur exhibits and commercial exhibits. We shall have two evening banquets, one on August 28 and the second on August 31 as the Convention finale. Field trips will be made to the National Bureau of Standards in Boulder and the radio telescopes on Table Mesa, to the Air Force Academy and the Colorado Springs area, and to the High Altitude Observatory at Climax - all are repeats of 1959 field trips. Other possible trips are being investigated. The hard-working Convention Coordinator is again Ken Steinmetz, 1680 West Hoye Place, Denver 23, Colorado.

The Editor would urge all A.L.P.O. members who can do so to make a special effort to attend what will surely be a very outstanding meeting. Papers are still needed for the A.L.P.O. portion of the program; the procedure to be followed is given above. Papers have so far been promised by Joel Goodman, George Rippen, Dale Cruikshank, Clark Chapman, David Meisel, and Rodger Gordon. We also want an A.L.P.O. Exhibit; there will be more details in our next issue, but members should start thinking of what they can contribute. Lunar and planetary photographs, drawings, and charts have been found to be the most satisfactory exhibit material in the past.

VENUS SECTION REPORT: EASTERN APPARITION, 1962, FIRST PORTION

By: William K. Hartmann, 1962 A.L.P.O. Venus Recorder

Part I: Observers and Observations

Some 406 visual observations were received by the section for the 1962 eastern or evening apparition, a 67% increase over the previous record-breaking 1960-61 eastern apparition. Numerous useful ultraviolet photographs were also available. More gratifying than the numerical increase in observations were improvements in style and observing technique, especially among members who were beginners a few years ago.

Observations were received from the following:

Anderson, C.A.	6" Refl.
Anthenien, Larry	6" Refl.
Beltz, Richard	8" Refl., 6" Refl.
Brasch, K.	8" Refl.
Chalk, K.	6" Refl.
Chapman, Clark R.	36" Refl., 4.3" Refr.
Cooke, D.	6" Refl.
Cragg, Thomas A.	12" Refl., 6" Refl.
Cruikshank, Dale P.	82" Refl., 36" Refl., 12" Refl., 4.3" Refr., 4" Refl.
Delano, K. J.	8" Refl., 3½" Refr.
Dragesco, J.	?
am Ende, Gerald	10" Refl., 5½" Refl., 3" Refr.
Evans, C.L.	2.4" Refr.
Gaherty, Geoffrey,Jr.	8" Refl., 6" Refr.
Giffen, Charles H.	9½" Refr.
Gordon, Rodger W.	10" Refl., 6" Refl., 4¼" Refl., 4" Refr.
Hartmann, William K.	36" Refl., 8" Refl., 6" Refl., 4.3" Refr.
Heillegger, G.A.T.	8" Refl.
Hicks, Earl F.	5" Refr.
Jamieson, Harry	10" Refl., 5½" Refr.
Johnson, Craig L.	10½" Refr.
Kubinsky, Paul M.	8" Refl.
Lund, Jeffrey	6" Refl.
Mackal, Paul K.	6" Refl.
Marshall, James V.	4.3" Refr.
Olivarez, José	17" Refl., 12½" Refl., 2.4" Refr.
Reese, E.J.	8" Refl.
Ricker, Charles L.	6" Refl., 3" Refr., 2" Refr.
Rippen, George W.	6" Refl.

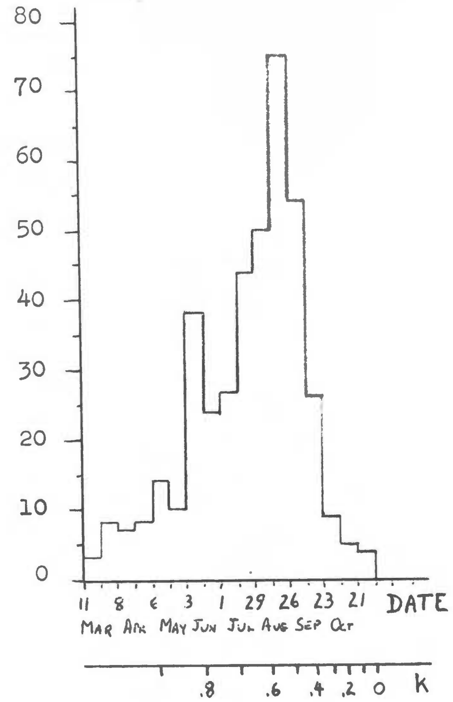


FIGURE 16. Histogram to show frequency distribution of A.L.P.O. 1962 evening apparition Venus observations. Two-week intervals. Prepared by William K. Hartmann. The quantity K is the percentage of the disc illuminated by the sun and is thus a measure of phase. K is about 1 at superior conjunction, 0.5 at dichotomy (near greatest elongation), and about 0 at inferior conjunction.

Solberg, Gordon	6" Refl.
Snell, Charles	6" Refl.
Stone, Francis, Jr.	3" Refl.
Tronfi, A.	10" Refl., 3½" Refr.
Wedge, G.	8" Refl., 6" Refr., 6" Refl., 4" Refr.
Whitby, Sammy	3" Refl.
Williams, David B.	6" Refl., 3" Refl.
Wood, C.A.	36" Refl., 4.3" Refr.

Figure 16 shows the time distribution of observations in the section files for this apparition.

Part 2: Markings on the Disk, Exclusive of Cusp Areas

Following the practice of previous reports, the data are summarized in tabular form (Table I). The various types of markings considered were defined in the 1960-61 report[1] (pp. 108-112). Because of the subjective nature of this tabulation, the statistics are reliable to not much better than one significant figure, even with large samples. Small samples of ultraviolet photographs have also been included in the table, but the statistics (though more objective) are probably no more well determined. Enough observations were available for 1962 that a sample of 66 observations by the most experienced observers was considered separately.

Table I: Types of Dusky Markings Exclusive of Cusp Bands vs Frequency of Occurrence, k = .999 to k = .101

Percentage of Observations

(body of Table on next page)

Type of Marking	11 UV Photos 1927	213 Drawings 1960-1961 (Eastern)	92 Drawings 1961 (Western)	344 Drawings 1962 (Eastern)	66 Drawings 1962, Most Experienced Observers	22 UV Photos 1962
No Markings	0%	8%	16%	6%	0%	5%
Terminator Shading	100	16	23	40	59	100
Radial Pattern	0	7	2	4	2	0
Band Pattern	36	19	15	17	24	46
Streaky Markings of any sort	45	51	38	42	50	50
Amorphous Markings	64	59	54	57	58	59

Some comments on the meaning of each category in Table I must now be given.

No Markings: The average observer usually makes half a dozen or so observations before he begins even to suspect detail on Venus. After experience is gained, the fraction of observations where nothing is suspected decreases. For all observations taken together, 5% to 15% show no detail, and even at ultraviolet wavelengths a few percent of the satisfactory images may show no detail outside the cusps. On the nights when the detail is most prominent at short wavelengths ($\sim$3600 Å) it can be traced to the greatest wavelengths ($\gtrsim$4200 Å), and sometimes well into visual wavelengths photographically.

Terminator Shading: This category has little bearing on the nature of Venus. The data simply show that only about half of the observations depict the brightness gradient from the limb to the terminator, which is clearly shown to exist photographically. Unless one makes a special effort to look for this, he tends mentally to compensate for it and to draw only the residual detail.

Radial Pattern: This is a somewhat controversial and important category because a slow rotation period, suggested by recent radar measures[2], may favor the establishment of a radial circulation pattern [3]. The A.L.P.O. visual observations indicate that there is no easily confirmed, spoke-like radial pattern on Venus. Table I is not representative, however, because a radial pattern could be clearly recorded only with $k > .5$ ($i < 90°$). But the section records show that even in this phase range, less than 9% of the observations record a radial pattern. Further, the most experienced observers definitely record such a spoke-like pattern less often than the average observer. By "radial pattern" we have meant in Table I a well-defined system of radiating spokes. We next consider a more liberal interpretation of the term "radial pattern". A count was made of all drawings which showed streaky markings converging roughly toward the subsolar point, even if the "spokes" did not all join at that point. This tabulation included all the observations previously included in Table I. The results are that before dichotomy, 19% of the observations fell into this category, and thereafter, 4%. Similarly, among the 1962 UV photos, about one in five of the acceptable images before dichotomy shows this tendency toward a radial arrangement. Usually these were cases where the typical bands appeared to slope toward the sub-solar point. Among the Ross photos[4], a similar phenomenon is seen on June 28, 1927 and possibly on June 26, 1927. We now compare these data with the results of Dollfus[5]. By superimposing consecutive drawings from several days, Dollfus mapped patterns of markings apparently fixed with respect to the sun. These show a radial pattern, which Dollfus took to be at a low level, sometimes obscured by higher clouds. The present observations, both photographic and visual, do not suggest a rigidly fixed dusky radial pattern because the location of a "spoke" one day may mark the site of a light area later, with a new "spoke" in a nearby position. However the observations are in accord with a rough and changeable radial pattern which is usually obscured by other (higher?) cloud patterns. Tentatively, lacking better data, we conclude that at gibbous phases such a pattern is faintly recognizable on only one out of five nights, but that the observations are not incompatible with the suggestion made observationally by Dollfus[5] and supported semi-theoretically by Mintz[3], that this pattern lies at a low level, usually masked by other, perhaps more banded patterns aloft. It must be emphasized again, however, that the visual observations are of a very low statistical weight.

Band Pattern: In this important category we see that on two out of five nights, a banded pattern is conspicuous in the ultraviolet. Since the visual observations for a given night are not always compatible with one another, the figures in Table I probably represent an upper limit for the detection of the bands in visual light - one out of five nights.

Streaky Markings: Whether or not by chance, the visual observations and the UV photographs agree that during slightly less than half the time, streaky dusky markings are present on Venus. One gains the impression that higher resolution UV photos might yield a greater fraction. Study of Tiros photographs suggests that the comparable figure for the earth in visual light would be less, because of the frequency of large-scale twisted cyclonic patterns - but there is little likelihood that the atmospheric levels represented by the two cases would present analogous circulation patterns.

Amorphous Markings: This is one of the most constant statistics in the records. On nearly 60% of the drawings and photographs there are patchy markings, dusky and bright, too broad to be classified as bands or streaks, though often their borders parallel the usual band directions.

It is often thought that of all forms of markings, a banded pattern strongly predominates. It is interesting to note that on the basis of the above data, even in the ultraviolet this pattern is not so dominant as one might suppose from the number of references to it. As Kuiper has suggested[6], the bands may represent a "quiescent" circulation pattern; but in this case the pattern is frequently disturbed. Further remarks on the reliability of the visual observations are to be found in Part 8 of this paper.

Part 3: Cusp Caps and Cusp Bands

Table 2 gives an up-to-date summary of available cusp cap and cusp band statistics. The first column is based on the 1927 Ross photographs, a very small sample. The Ross photos apparently hold detail near the cusps, in spite of the loss of detail near the central terminator because of contrast. The second column is based on Bartlett's work[7,8] on A.L.P.O. visual observations, 1944-56. The next four columns are based on the writer's analyses of A.L.P.O. visual observations, 1960-62. The last column gives the results for the 1962 UV photographs. The latter do not hold detail at the cusps very well, and the percent of observations showing neither cap may therefore be too high.

It is interesting to note that the sample of observations by the more experienced 1962 observers (15 in number) may not necessarily be the more accurate for two reasons: (1) it is smaller; (2) it is more influenced by individual biases because of the small number of observers. The only significant differences between all observers and the more experienced observers is that the more experienced observers more often recorded cusp bands and caps, and they did not so clearly record the apparently real brightness excess of the north cap (see below).

From Table 2, the following conclusions are made: (1) More often than usual, the north cusp cap was the brighter and larger of the two in 1962. (2) The relative prominence of the cusp caps and bands is not fixed. It has long been known from UV photographs that the cusp caps and bands usually

Table 2: Cusp Cap and Cusp Band Statistics

	1927 (Eastern) 13 UV Photos	1944-56 (Mixed) 830 Obsvtns	1960-61 (Eastern) 212 Obsvtns.	1961 (Western) 85 Obsvtns.	1962 (Eastern) 344 Obsvtns.	1962,66 Selected Obsvtns.	1962 22 UV Photos
South Cap Alone Visible	15%	11%	11%	8%	11%	12%	21%
Both Caps Visible	77	35	42	46	40	69	26
North Cap Alone Visible	8	7	14	7	10	8	32
Neither Cap Visible	0	47	33	39	38	11	21
South Cap Larger	44	59	37	28	37	39	33
Caps Equal in Size	11	21	13	34	19	18	7
North Cap Larger	44	20	50	38	44	43	60
South Cap Brighter	67		29	30	34	42	27
Caps Equal in Brightness	17		28	42	12	12	0
North Cap Brighter	17		42	28	53	46	73
South Band Alone Visible	23	21	12	10	14	23	25
Both Bands Visible	46	12	13	14	22	47	20
North Band Alone Visible	23	4	10	8	8	9	20
Neither Band Visible	8	63	64	68	56	21	35

----

show marked changes within time periods on the order of a day. To the writer's knowledge, Bartlett[7] first suggested that statistics over periods of years indicated differences between the cusps. He found the south cap and band to be markedly the more prominent in the interval 1944-56. The results from 1960-62 indicate that even this average prominence shows long-term fluctuations, with the north cap and band being more prominent in 1962. In summary, if the data are meaningful to one significant figure, long-term variability in the cusp caps and bands is present in addition to short-term variability. (Bartlett's finding that the south cap was the more prominent in 1944-56 was confirmed by an independent method of analysis by the writer, using the same observations.) (3) In spite of the variations discussed above, the south cusp band is usually more prominent than its northern counterpart.

Are these data really significant? Once again, a pessimistic note must be added. A preliminary analysis indicates that when observers make estimates of relative brightness of the cusps on a given night, their independent estimates concur little more frequently than would be expected by chance. Visual observers should always record in intensity estimates the relative brightness of the two cusps so that this line of investigation can be continued. There must be a very great amount of "noise" in the data of Table 2; and if the visual differential brightness estimates of cusp caps cannot be shown to be significant, the visual observations may have to be rejected entirely. The whole question remains open.

Part 4: Ashen Light and the Dark Side

Between July 11 and Nov. 1, 23 observations of anomalous dark side conditions were made. Seven of these were reports of the dark side's being darker than the sky. These were near 0^h U.T. on the following dates: July 20, Aug. 10, Aug. 20, Aug. 28, Aug. 30, Sept. 11, and Oct. 30. This phenomenon, which has been discussed in these pages before, is almost certainly a contrast-produced illusion. The writer has verified on several occasions and at various phases that such an illusion can be observed, and he is satisfied that no phenomenon peculiar to Venus was involved. Five of the reports were by P. Mackal, who noted only a strip near the terminator as being very dark, rather than the usual complete unilluminated portion. (Note added in press: C. Snell reported a similar appearance on several additional nights.) In four out of the seven cases, there were other reports by observers within a few hours who specifically checked the dark side and saw no ashen light phenomena.

There remain 16 reports of ashen light. Twelve of these were of bright areas near the terminator. Of the total of 16, six were accompanied by other observations within a few hours by other observers who specifically checked the dark side and saw no ashen light. This argues for the rejection of these reports, but it is possible that the ashen light's prominence could change radically within a few hours, or vary with observing conditions. For example, Anthenien on Aug. 6 recorded light streaks on the dark side at 3:30 U.T. which were difficult 15 minutes later. Moore[9] also reports short period changes in the visibility of the ashen light, and attributes them to changing contrast conditions. Therefore, it is possible that observers a few hours apart would not both see a given real display of ashen light. Observers who see the ashen light should observe it as long as possible and record any changes as a function of sky brightness, seeing, and transparency. The reports of ashen light were mostly near 2^h U.T. on July 11*, July 15*, July 20, July 22*, Aug. 6*, Aug. 23*, Aug. 26, Aug. 31*, Sept. 2, Sept. 23 (0:30 U.T.), Sept. 23 (0:32 U.T.), Sept. 29, Oct. 1, Oct. 14, Oct. 20, and Oct. 26, where * indicates the six observations where near-simultaneous observers rejected ashen light. (On July 20, Aug. 26, and Sept. 2, there were other observers who did not report ashen light but at the same time reported no specific check for its presence.)

The most interesting reports were the two independent ones on Sept. 23 by Olivarez and Rippen. Neither had reported ashen light in earlier observations during this apparition. Olivarez at 0:30 U.T. reported a wide bluish lune bordering the terminator (with poor conditions and a 2.4-inch refractor), while Rippen at 0:30 - 0:35 U.T. reported the whole dark side at intensity 0.3, with the limb of the unilluminated side being brighter and making a halo of intensity 0.6 outlining the dark side (with good conditions and a 6-inch reflector). No other observations are available within 12 hours, and an observation by Olivarez with a 17-inch reflector (poor conditions) at 1:15 U.T. on the preceding night recorded nothing anomalous on the dark side.

On Sept. 30, at 17:00 U.T., A. Tronfi with a 10-inch reflector reported a faint light lune near the terminator and a thin light halo around the dark limb.

It is very encouraging to note that we can make such extensive reference to near-overlapping observations - but we still need better observations. The biggest simple improvement in 1964 would be that each observer regularly carefully checks the dark side and records in writing what he sees.

Part 5: The Illuminated Atmosphere

An unusually extensive series of observations is available for the inferior conjunction period, when the extended cusps were carefully observed. A separate report is therefore planned for the 1962 inferior conjunction period. No observations of extended cusps were made before October, except for Rippen's and Tronfi's reports of a light halo, described under ashen light observations.

Part 6: Terminator Irregularities

As usual, there were occasional reports of serrations or waviness in the terminator. These will not be described in detail here. In the future, for purposes of analysis, each observer should state in writing whether the terminator was specifically studied; and if so, whether it was smooth and regular or showed anomalies.

Physically, one might expect that large, isolated cloud masses might occasionally be present at greater heights than the mean cloud level. Data from the Mariner II flight indicate that the cloud tops are at about 60 miles above the solid surface and that the clouds are 15 miles thick.[10] It can be shown that a column extending another 15 miles above the mean cloud top level should appear as a dim star-like point as far as one second of arc from the mean terminator near the time of dichotomy. Could this be detected? We must recall that the Schröter effect[11,12,13,14] suggests that observers do not detect a strip about one second wide along the terminator because it is too faint. Therefore, our hypothetical high clouds might also be too faint to be seen. Observers with large apertures, good transparency, and good seeing should search for either the presence or absence of this phenomenon. Careful studies could shed light on both the structure of the atmosphere of Venus and the phase anomalies.

The cusp indentation statistics, continued from last year, are summarized below in Table 3. All available evidence suggests that these indentations, close to the north and south cusps, are objectively real features of Venus. They may be caused either by surface irregularities, as discussed by Bartlett[7], or by contrast effects resulting from dark cusp bands crossing the terminator. See also reference 14 (pg. 106) for remarks related to Table 3.

Table 3: Percentage of Observations Showing Cusp Indentations

	1944-56 830 Obsvtns.	1960-61 235 Obsvtns.	1961 79 Obsvtns.	1962 280 Obsvtns.
South Indentation	11%	3%	2½%	5%
North Indentation	5	4	0	2

References

1. Hartmann, William K. 1962, Str. A., 16, 106
2. Jet Propulsion Laboratory 1963, Mariner Mission to Venus, p.108, New York: McGraw-Hill.
3. Mintz, Yale 1961, Planet. Space Sci., 5, 141.
4. Sagan, Carl 1961, Science, 133, 849.
5. Dollfus, A. 1961, Planets and Satellites, Ch. 15, ed. Kuiper and Middlehurst, Chicago: Univ. of Chicago Press.
6. Kuiper, G.P. 1954, Ap. J., 120 ,603.
7. Bartlett, James C. Jr. 1958, Str. A. 12, 43.
8. -------------------- 1958, Str. A. 12, 123
9. Moore, Patrick 1959, The Planet Venus, p. 98, MacMillan: New York.

References (Contd.)

10. Jet Propulsion Laboratory 1963, Mariner Mission to Venus, p. 111, New York: McGraw-Hill.
11. Hartmann, William K. 1962, Str. A., 16, 222.
12. ------------------- 1963, Str. A., 17, 2.
13. Giffen, C.H. 1963, Str. A., 17, 89.
14. Hartmann, William K. 1963, Str. A., 17, 99.
15. Moore, Patrick 1963, J.B.A.A., 73, 184.
16. Hartmann, William K. 1962, Str. A., 16, 171

(to be concluded in next issue)

THE TOTAL LUNAR ECLIPSE OF DECEMBER 30, 1963

By: Walter H. Haas, Director A.L.P.O.

Introduction: Circumstances and Observers

This lunar eclipse is already famous to most of our readers for the extreme dimness of the moon in the umbra. The circumstances were as follows:

Moon enters penumbra	8^h $25^m.3$, U.T.
Moon enters umbra	9 24.3
Total eclipse begins	10 27.3
Middle of eclipse	11 06.8
Total eclipse ends	11 46.2
Moon leaves umbra	12 49.2
Moon leaves penumbra	13 48.3

It will be seen that the early stages of the eclipse were presented to good advantage all over the United States but that in the Eastern States the moon was at a low altitude on a dawn sky during totality and emersion from the umbra.

Several articles about this eclipse have been published, among them the following:

1. "A Remarkable Eclipse of the Moon", Sky and Telescope, Vol. XXVII, pg. 142, March, 1964. Excellent general description.
2. Joseph Ashbrook, "Measuring the Earth's Shadow", Sky and Telescope, Vol. XXVII, pg. 156, March, 1964. A discussion of umbral contact crater timings and their interpretation in terms of enlargement of the earth's geometric shadow.
3. "December 30 Lunar Eclipse", Review of Popular Astronomy, Vol. LVIII, No. 526, pg. 12, February-March, 1964.
4. The Eyepiece (A.A.A. Observing Group monthly), Vol. XI, No. 2, February, 1964, several observational reports, chiefly on umbral contact crater timings.
5. " The Lunar Eclipse of December 30th", Skyward (Montreal Centre monthly newsletter), February, 1964 issue.

The following persons have communicated eclipse observations:

Observer(s)	Station	Telescope(s)
John E. Bortle	Mount Vernon, N.Y.	6-inch refl.,binoculars
K. Chalk and W. Cahill	Teaneck, N.J.	12.5-inch refl.
Clark R. Chapman	Buffalo, N.Y.	10-inch refl., finder, and binoculars
Deniel J. Fernandes and Stephen Forczyk	Fall River, Mass.	4-inch refl.,3-inch refr.
Walter H. Haas	Las Cruces, N. Mex.	12.5-inch refl.

Observer(s)	Station	Telescope(s)
Alika K. Herring	Tucson, Ariz.	12.5-inch refl.,21-in.refl.
Harry Jamieson	Muncie, Ind.	10-inch refl.(?)
Herbert A. Luft	New York, N.Y.	?
David Meisel and others	Fairmont, W. Va.	8-inch refl.
Rodney A. Norden	Norfolk, Va.	8-inch refl.
T. Osawa and M. Shimada	Kobe City, Japan	6-inch refl.
Elmer J. Reese	Las Cruces, N. Mex.	8-inch refl.
Takeshi Sato and others	Hiroshima, Japan	?
Gordon Solberg and R. B. Minton	Las Cruces, N. Mex.	6-in. refl., 4-in. refl., 5 x 50 Moonwatch refr.
Ken Thomson and others	Pasadena, Texas	16-in. refl., 8-in. refl., 3 6-in. refls.

Sample eclipse photographs have been submitted by Meisel and Norden. Several other observers write of taking photographs.

The Penumbral Shadow

The penumbra was first visible to Norden in his 8-inch at $8^h\ 34^m$, U.T. (he found it easy then and thinks that he could have seen it earlier), to Meisel with the eye at $8^h\ 35^m$, to Bortle at $8^h\ 45^m$ with eye, binoculars, and 6-inch telescope, to Solberg and Minton at $8^h\ 51^m$ (first suspected by Solberg at $8^h\ 43^m$ and by Minton at $8^h\ 47^m$), and to Haas in a 12.5-inch reflector at $8^h\ 52^m$ (suspected at $8^h\ 47^m$). The color of the penumbra was recorded as coppery by Norden, brownish gray by Meisel, and sandy brown by Bortle. At $9^h\ 20^m$ Solberg and Minton estimated the visible width of the penumbra at about one-third of a lunar radius, and Bortle near $9^h\ 24^m$ estimated four-tenths of a lunar diameter.

Border of the Umbra

As the umbral shadow crossed the moon before totality and again after totality, Haas recorded a slate-blue border perhaps 10" to 20" in width. Meisel called its width less than 20". Bortle recorded a "bluish contrast border". Thomson and his co-workers report a diffuse brownish band about 90" wide leading the umbra before totality, with a bluish cast near its edge as totality grew near. Chapman recorded at $10^h\ 21^m$: "As totality neared, the leading edge of the shadow was seen to be a greenish blue followed perhaps by an exceedingly dark deep red hue, while the remaining sliver [of the moon] became a yellowish or ochre color".

Brightness of Eclipsed Moon

The "brightness" of the sub-title might well logically be replaced by "extreme faintness", for all observers agree that the moon in the umbra was amazingly and very abnormally dim. Several observers explicitly state that the moon in eclipse was much dimmer than in other lunar eclipses which they had personally observed in recent years. Those who made estimates on the Danjon Scale (e.g., Sky and Telescope, Vol. XXVI, pg. 325, December,1963) rated L at 0 or 1, where 0 is the dimmest possible.

Did the moon actually disappear during the December 30, 1963 eclipse? Some observers so report; e.g., Luft remarks: "During totality the moon became completely invisible, and also with the telescope no trace whatsoever of the moon could be detected". It appears conclusive, however, that all such reports that the moon disappeared in eclipse come from the Eastern States, where totality was largely seen at a low altitude on a dawn sky, and some observers so reporting were further handicapped by poor transparency. It may well be, however, that portions of the lunar globe did at times disappear for the unaided eye or binoculars even with a very clear sky. Reese and Haas comment on the nebulous outlines of the eclipsed moon in transparency 6.2 or better (Reese saw stars of magnitude 6.2 in Gemini); and the latter at 11:00, U.T. noted that large parts of the disc were invisible to the eye.

Figure 17 summarizes 30 estimates by 14 different observers of the integrated stellar magnitude of the eclipsed moon. The rapid fading at the beginning of totality and the rapid brightening at its end are well shown. Special interest may attach to 4 independent estimates by Meisel and his coworkers between 11:10 and 11:15; they found a stellar magnitude near mid-totality of $+ 3.75 \pm 0.08$. Figure 17 may be compared to the similar chart in Sky and Telescope, Vol. XXVII, pg. 143, March, 1964; there are many common observations in the two sets.

Color and Other Aspects of Eclipsed Moon

All observers who mention color at all comment on the extreme lack of color at this eclipse, presumably a consequence of the dimness of the moon. The moon was chiefly described as gray, though individual impressions naturally varied. Luft, Solberg, and Minton speak of the umbra as copperish near $10^h\ 0^m$ (before totality) but gray during the rest of the eclipse. Slight bluish tones of the mostly gray moon in the umbra were noted by Chapman, Sato, Jamieson, and Westfall; contrariwise, Reese at $11^h\ 5^m$ recorded "gray with scarcely a tinge of copper", and Haas at $10^h\ 45^m$ noted "a widespread faint reddish or yellowish cast". Solberg and Minton report that guided 35-mm. Anscochrome ASA 32 slides, with exposures of 5-10 minutes, show the moon to be brown. As we shall see a little later, the north limb region of the moon differed from the general coloration described above.

Meisel's team estimated the spectral class of the eclipsed moon between $11^h\ 10^m$ and $11^h\ 15^m$ to be F, one class bluer than the sun. As a comparison, their estimate for the March 13, 1960 total lunar eclipse was class K. Amateur observers should enjoy making such estimates at future eclipses, comparing the moon to stars of known spectral types.

Again as a consequence of the remarkable dimness of this eclipse, lunar features inside the umbra were very hard to distinguish. A note by Bortle is typical: "No surface features could be seen at mid-eclipse such as maria, craters, etc." Meisel (8-inch refl.) could barely see Mare Crisium at $11^h\ 0^m$. Farther west, Reese (8-inch refl.) noted Aristarchus and Kepler near mid-totality. Solberg and Minton found the maria difficult early in totality with 4-inch and 6-inch telescopes but remarked Aristarchus in the 6-inch at $11^h\ 22^m$. Haas (12.5-inch refl.) at $10^h\ 45^m$ compared the general aspect to that of the earthshine about 5 days after New Moon and could see little detail besides the coarse pattern of the large maria.

Many observers were surprised by a greater brightness of the north limb region of the eclipsed moon, surprising because this area was most deeply immersed in the umbra and would hence be expected to be dimmest. Individual descriptions again vary. Solberg and Minton report that 35-mm. Anscochrome ASA 32 slides with 5-10 minute exposures "show the brightening to be a brilliant orange". Jamieson recorded with the naked eye an "orange black patch" in the northern hemisphere. Bortle described the north and northwest limbs as "dull reddish" near 10:20, U.T. (west in I.A.U. sense, the hemisphere of Aristarchus). Urata in Japan sketched the same lunar area brightened at 10:24. Chapman noted a "ruddy limb coloring" on the northeast limb (I.A.U. sense) near 10:33, for a number of minutes.

What was the cause of this brightening? Was it merely an unusual distribution of light within the umbral shadow? Did we have an abnormal luminescence of the north limb during totality? It can hardly be a normal greater brightness of the north limb, which would then be so shown on photographs outside of eclipses. The brightening is certainly not present during most lunar eclipses. The position of the brightening probably did not change much during totality, with center apparently not far from the moon's north pole. This statement rests primarily on a study by Solberg and Minton of their photographs. The data available hardly justify further analysis. Its value is weakened by a failure of some observers to specify times when

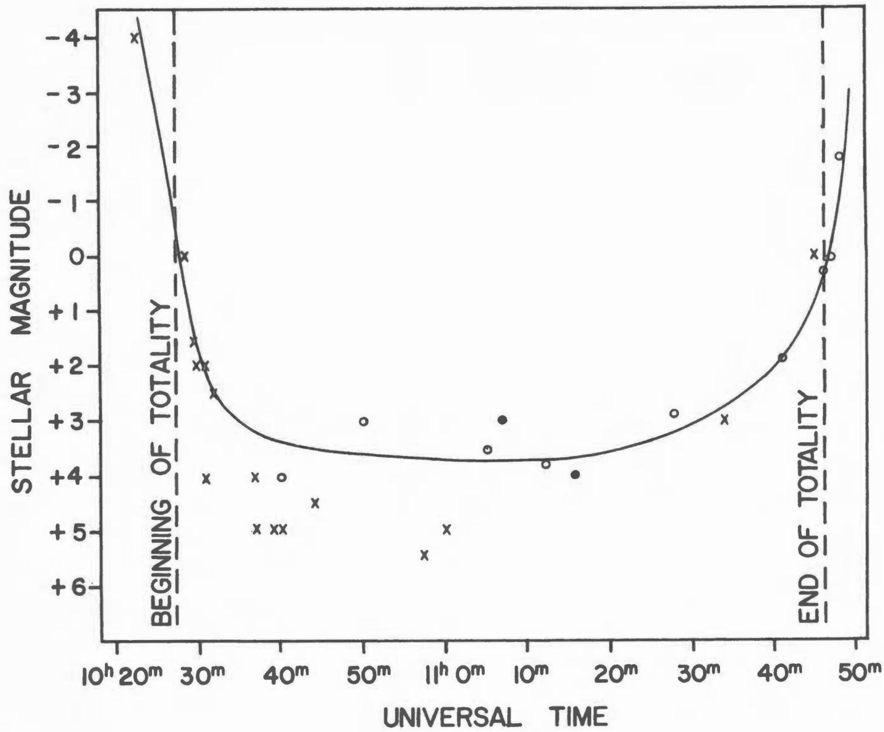


FIGURE 17. The observed integrated stellar magnitude of the eclipsed moon during the eclipse of December 30, 1963 as a function of Universal Time. 14 A.L.P.O. observers, 30 estimates. Open circles - moon compared to stars of known magnitudes. Closed circles - moon dimmer than plotted value. X's - other observations. Prepared for publication by Ray Montes.

----

reported aspects were observed and by a failure of some reports to clarify how lunar east and west were being used, I.A.U. system or otherwise.

Umbral Contact Crater Timings

This project constituted the principal program of our observers. Most or all of the observations we have were also sent to Dr. Ashbrook and were employed by him as part of a much larger set in his paper cited above.

Lunar Meteor Searches

Something of the background of this project is given by Kenneth Chalk in his article "Theoretical Aspects of the Lunar Meteor", Str. A., Vol. 17, pg. 19, Jan.-Feb., 1963. The dimness of the eclipsed moon furnishes an unusual opportunity to watch for possible lunar meteoritic impact-flares and/or possible lunar meteors. In view of the extreme dimness of the December 30, 1963 lunar eclipse, it is unfortunate that very few such searches were then made. Haas observed with a 12.5-inch reflector from 10:43 to 11:28, U.T., with a field of view about 90% of the diameter of the moon, but was handicapped by a failure of the telescope drive to operate. Solberg observed the western half of the disc from 11:25 to 11:29. Results were negative.

Possible Eclipse-Caused Changes

Here is a program in which experienced A.L.P.O. lunar observers are peculiarly qualified to contribute. It is critical, however, to appreciate the necessity for adequate controls: peculiar appearances of lunar features soon after emersion from the umbra must be carefully compared to appearances before the eclipse and to aspects under essentially the same solar lighting on other dates, with careful allowance for the role of penumbral lighting, seeing, transparency, etc. At this eclipse interest was naturally great in the red colors in the Aristarchus-Herodotus region recorded at the Lowell Observatory on October 30 and November 28, 1963. A phenomenon apparently occurring soon after sunrise may well also occur when sunlight returns after an eclipse. Reese found the appearance of the Aristarchus-Herodotus region quite normal from 4:00 to 6:00, U.T., as did Haas in intermittent views from 8:05 to 9:18 and Jamieson from 9:32 to 9:50. Aristarchus was in the umbra from (about) 9:30 to 12:01. (Jamieson must have watched the position of Aristarchus inside the shadow.) Reese then observed this region until 12:30 and found no unusual colors but thought that Aristarchus wall bands A and B may have been unusually faint on the upper half of the inner west (I.A.U.) wall. Haas observed at intervals from 12:02 to 13:10 and found no colors; perhaps compatibly with Reese, he observed the dark bands outside the west rim of Aristarchus averaging slightly darker than those on the west inner wall. Haas was uncertain of a change from the pre-eclipse aspect. Reese's bands A and B are shown in his 1946-56 map of Aristarchus, Str. A., Vol. 10, pg. 35, March-April, 1956. Herring observed Aristarchus and vicinity with negative results during this eclipse, using both direct vision and Wratten Filters 45 and 47B in searching for colors; however, the seeing was very bad in his post-eclipse views.

Haas observed the Linné white area for possible changes in size and brightness, comparing it to spots of similar appearance on the Mare Serenitatis. The eclipse had no detectable effect on Linné. Sato suspected soon after totality a brightening of the Copernicus rays near Eratosthenes, an abnormally short south end of the dark area in Riccioli, and others; these effects disappeared after the moon left the penumbra and were probably caused by dim illumination only.

Miscellaneous

Minton and Solberg searched for the L 5 "cloud satellite" near mid-totality; with transparency above 6, Solberg suspected something in the necessary position. Others might like to try at future eclipses. Meisel and Chapman timed some occultations.

The Total Lunar Eclipse of June 24-25, 1964

The circumstances will be as follows:

Moon enters penumbra	June 24,	21^h	$58^m.4$, U.T.
Moon enters umbra		23	09.3
Total eclipse begins	June 25,	0	15.5
Total eclipse ends		1	56.9
Moon leaves umbra		3	03.1
Moon leaves penumbra		4	14.0

Totality will find the moon rising on the Atlantic Coast of the United States. Farther west less and less of the eclipse will be seen. In Europe conditions are very favorable with the middle of the eclipse near midnight. We hence appeal to European members of the A.L.P.O. to observe this eclipse and to communicate their results to us immediately afterwards. The discussion above should certainly indicate several worthwhile projects. The brightness of the eclipse will have special interest. We shall greatly appreciate the help of our European colleagues in observing this phenomenon.

AN INVITATION FROM NASA TO THE ALPO

The following letter was written to Walter Haas by Dr. Urner Liddel, Assistant Director and Chief of Sciences, Lunar and Planetary Programs, Office of Space Science and Applications, NASA Headquarters, under date of February 17, 1964:

"As you well know, the question of transient phenomena on the Moon has received renewed attention recently. The Alphonsus events reported by Alter and Kozyrev, and the Aristarchus events reported by Greenacre and Barr are perhaps the most widely known sightings of recent times. The evidence in favor of transient phenomena on the Moon has become strong enough to warrant an organized effort to study such events for their scientific merit alone. In addition, this country's manned and unmanned lunar exploration effort clearly has a vital interest in phenomena which occur on the Moon.

"For these reasons, the National Aeronautics and Space Administration hopes to initiate a ground-based telescopic surveillance of the Moon. The initial aim of this survey is to assemble meaningful statistical information on the occurrence of changes in the appearance of the Moon. In this connection, it might be well to emphasize that negative sightings are equally as valuable as noticed changes. After a clear statistical picture has emerged, detailed physical investigation can begin.

"I would like to invite the Association of Lunar and Planetary Observers to join in this surveillance program. The large number of appropriately equipped and trained lunar observers in the Association would enable it to make a significant contribution to this important program. I am enclosing further information on the proposed surveillance and hope that ALPO will join in this effort."

Space unhappily permits no discussion here; but the Editor has expressed to NASA scientists our keen interest in this program, and he will welcome guidance by constructive comments and discussion from ALPO members. We hope to include in our next issue more detailed information and an early progress report.

The Strolling Astronomer

SUBSCRIPTION RATES

Single Issue (in stock) $1.00

6 Months - - - - - 2.50

1 Year - - - - - - 4.00

2 Years - - - - - 7.00

SPECIAL MEMBERSHIPS

Sustaining Members $10 per year

Sponsors $25 per year

ADVERTISING RATES

Full Page Display Ad $40.00

Half Page Display Ad 22.50

Quarter Page Display Ad 15.00

Classified or Listing (per column inch) 4.00

Discount of 10% on 3-time insertion.

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

Keep Informed on Astronomy and Space

Sky and TELESCOPE

THE WORLD'S LARGEST MONTHLY MAGAZINE ON ASTRONOMY

Join the leading astronomers and thousands of amateurs throughout the world who look to SKY AND TELESCOPE as a welcome monthly package of pleasingly illustrated informative articles, up-to-date news items, observing material, telescope making notes, and the latest advances in space.

SUBSCRIPTION:

In the United States and possessions	One year, $5.00; two years, $9.00; three years, $13.00.
In Canada and Pan American Postal Union Countries	One year, $6.00; two years, $11.00; three years, $16.00.

STAR ATLASES

We publish the largest selection of sky atlases to fit your observing needs. Whether you're a beginning amateur or an advanced astronomer, write for our free 24-page booklet "C" describing these celestial maps and other Sky Publications.

Please enclose check or money order payable to

Sky Publishing Corporation

49 Bay State Road
Cambridge 38, Massachusetts