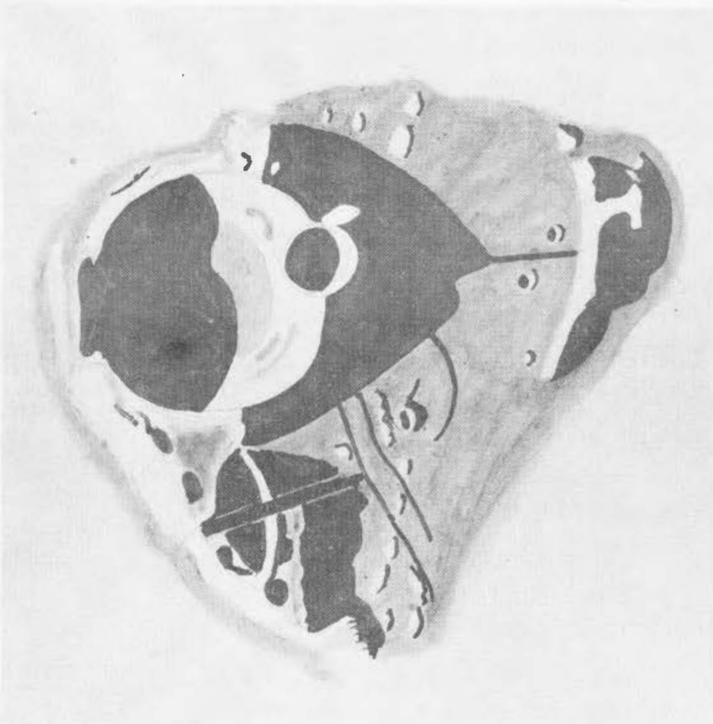
ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS

The Strolling Astronomer

VOLUME 10, NUMBERS 7 & 8 JULY-AUGUST, 1956



Drawing of Lunar Crater Cichus by Dr. H. P. Wilkins with Meudon 33-Inch Refractor at 540 X on April 23, 1953. Note Clefts and other Small Details.

THE STROLLING ASTRONOMER
1203 North Alameda Street
Las Cruces, New Mexico

In This Issue

ANNOUNCEMENTS

Merry Christmas and Happy New Year. This issue of The Strolling Astronomer is the last one which will go to our members before the year-end holidays. Therefore, we here wish each and every one of you, our readers, a most joyous Christmas Day and a happy and successful New Year of 1957. It is here fitting that we acknowledge our thanks for your help and support in the past, of which we shall try to be worthy. Good skies and good seeing to all!

Publication Dates. We regret very much that the mailing of The Strolling Astronomer continues to lag some months behind the months on the cover headings. We shall certainly try to close this gap, but it is risky to make definite promises as long as most of the Editor's time is claimed by his employment. Every subscriber will surely receive whatever number of issues he pays for, even if the dates of mailing are out of phase with the calendar. It is our policy to begin each new subscription with the last issue mailed, unless the release of the next issue is imminent. We request your continuing kind indulgence in this matter.

Latitude, Longitude, and Elevation Service. Astronomical observations sometimes require a knowledge of the latitude, longitude, and elevation above sea level of the station of observation. Mr. Walter F. Barber, Jr., 2080 Dunwoody St.,N.E., Atlanta 17, Georgia has kindly offered to provide this information for anyone who requests it of him. He uses government geological survey maps. Usually he will be able to determine latitude, longitude, and elevation from the address of the inquirer. We urge A.L.P.O. members to take advantage of Mr. Barber's service.

An International Meeting of Amateurs? It has been suggested that an international meeting of amateur astronomers might be attempted. The total eclipse of the sun in France in February, 1961 has been proposed as providing a suitable time and place. For amateur lunar and planetary observers an international meeting of this kind should offer, besides the pleasure of personal acquaintance with our colleagues in other lands, the possibility of planning more effective international cooperation in our work. A secondary gain might be the standardizing of certain lunar and planetary nomenclature. The difficulties in planning such a meeting so far ahead are obvious enough, not least among them the financial aspects. A joint sponsorship by the Astronomical League, the Western Amateur Astronomers, the British Astronomical Association, certain European and Oriental societies, and the A.L.P.O. has been suggested.

We should be glad to hear from our readers their opinions, favorable or otherwise, upon the proposed meeting.

SOME BASIC PROCEDURES IN PLANETARY PHOTOGRAPHY

by Philip R. Lichtman
(Paper read at the A.L.P.O Convention at Flagstaff on Sept. 1, 1956)

Planetary photography, at least as practiced by amateurs, is usually dependent upon "trial-and-error" methods for determining correct exposure-times, emulsions, and developing procedures. I have attempted to put these experiments on a more quantitative basis--in effect, to make their results predictable--so that an observer can rapidly select the optimum procedures for his particular telescope and atmospheric conditions.

Disturbances within the atmosphere rather than defects in our telescopes ultimately limit the quality of planetary photographs. As A.L.P.O. members realize, these disturbances manifest themselves in two ways, telescopically speaking: (1) "excursions"--lateral displacements of the entire image under observation; and (2) distortions of the image. Lateral shifts occur with an amplitude and frequency dependent upon "seeing" conditions. If extremely short exposure-times were feasible, planetary photographs would not suffer from lateral displacements of the image during exposure (although image distortions would still be present). Thus, it is advantageous to employ the shortest exposure-times possible. I shall describe a method for selecting emulsions which permit the use of rapid exposures and a pro-

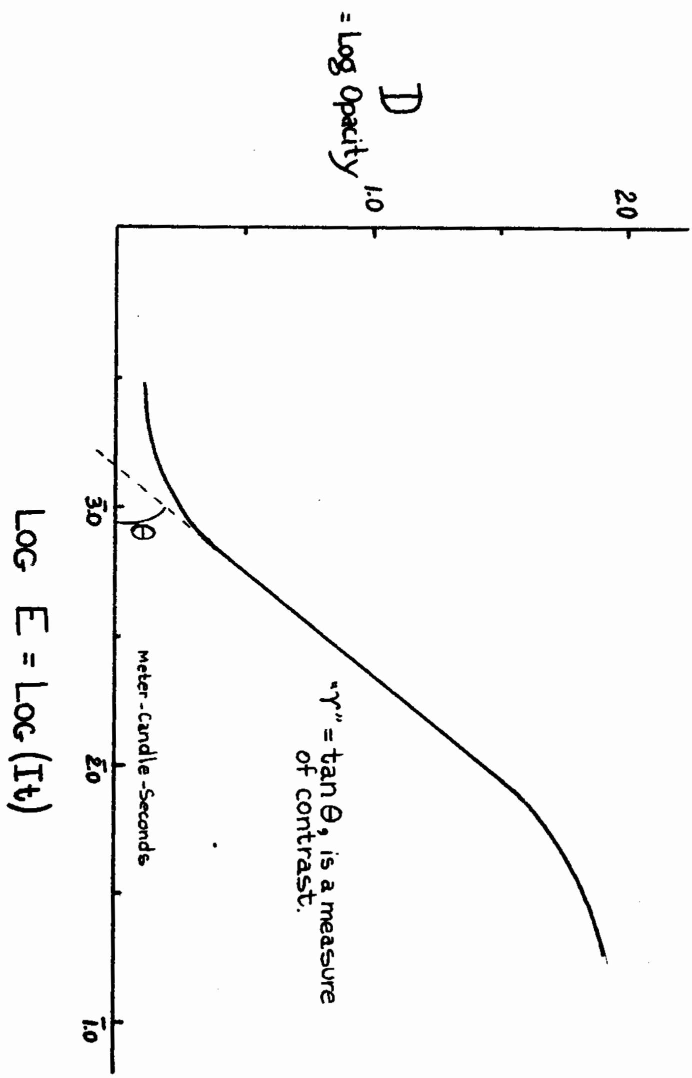


FIG. 1: TYPICAL "CHARACTERISTIC CURVE"

cedure for determining correct exposure-time with any given telescope and emulsion.

The characteristic response of a given photographic emulsion to illuminations of varying intensities is revealed by that emulsion's so-called "characteristic curve" (Fig. 1). The characteristic curve is a plot of a negative's darkness against the energy required to produce it—hence its alternative appellation, the "D-log E curve" (density vs. logarithm of exposure). Definitions of photographic "density" and "exposure" are in order. "Density" is a measure of a negative's blackness, equal not to "opacity" (reciprocal of transmittance of incident light), but rather to the logarithm of opacity. Thus, a negative that transmits 1/10 of the light incident upon it has a density of log 10, or 1; if the negative transmits 1/100 of the incident light, its density is log 100, or 2; if 1/1000 of the incident light is transmitted, density equals log 1000, or 3; etc. There are several reasons for using a logarithmic scale instead of a linear one; for instance, it is well known that the human eye's response curve to light of varying intensity (or to negative photographs of varying opacity) is more nearly logarithmic than linear.

"Exposure" is defined not in the ordinary sense as "time of exposure", but rather as the product of intensity and time. If we let E represent exposure, I represent intensity, and t represent time of exposure, then

(1) $E = It.$ More conveniently,

(2) $\log E = \log I + \log t.$

Since intensity is expressed in candle-meters, and time in seconds, exposure is in terms of meter-candle-seconds.

If we are given the characteristic curve of some emulsion, and if we know the intensity of our telescopic image, then we can find out how long an exposure-time is necessary to yield a photograph of given density; for density is a function of intensity and time--and knowing two of these factors, we can find the third. The trick, then, is to compute the intensity of our telescopic image. I have derived a formula for this purpose which, although not yet extensively tested, has thus far given me very accurate results:

$$(3) \qquad I = \text{antilog}\left(\frac{1-m}{2.5}\right) \times 8.5 \times 10^{-7} \times \frac{R^2}{kr^2} \times .01\ T,$$

where I = intensity (candle-meters);
m = stellar magnitude of planet under observation; [1]
R = radius of telescope's objective;
r = radius of planetary image in the focal-plane;
k = illuminated portion of planetary disk (from the Ephemeris);
T = telescopic efficiency, in percent.

I shall now return to our basic problem--selecting emulsions and image-sizes which permit the use of short exposure-times. Suppose the "seeing" is such that exposure-times of over 1/5 second would result in undue blurring from "excursions." (A more realistic figure would be 1/20 second; however, planetary images are rarely brilliant enough to be photographed in such a short time by small telescopes.) We must employ an image small enough that its intensity (which is proportional to the square of its radius) is sufficient to blacken the negative to an average density of, say, 0.80 with an exposure-time of 1/5 second. By referring to the characteristic curves of several emulsions, we observe that to produce a density of 0.8, the "fastest" emulsion (the one which we shall use) requires a log-exposure value of -2.3, while the "slower" ones require greater amounts of energy. We have decided upon an exposure-time of 1/5 second, whose logarithm is - 0.70. It is required to compute the image intensity necessitated by the foregoing conditions. According to equation (2),

$$\begin{aligned} \log E &= \log I + \log t. \quad \text{Substituting and solving for I,} \\ \log I &= \log E - \log t \\ &= -2.3 + 0.7 \\ &\doteq -1.6. \\ I &= .025 \text{ candle-meters.} \end{aligned}$$

All that remains to be done, is to determine by equation (3) what size image will produce an intensity of .025 candle-meters. This is done by solving formula (3) for r (radius of focal-plane image) rather than for I.

I have found the following procedure to be extremely helpful in choosing the best emulsion for a given set of circumstances:

(1) Determine the longest exposure-time that is permissible from the point of view of blurring from "excursions";
(2) Examine all available characteristic curves to ascertain which emulsion yields the greatest density for small log-exposures (I consider as "small" log-exposures of less than -2.50);
(3) Knowing the exposure-time to be employed and the density required (I find that for planetary photographs, 0.80 is a good average density), determine the intensity necessary to fulfill these conditions;

(4) Find out the resolving-power of the chosen emulsion to tell whether detail upon an image of the size predicted by the previous step will be lost in emulsion diffusion or grain. If this is the case, then it is necessary to enlarge the image and increase exposure time in spite of "seeing" effects. The entire process must then be repeated, in order to arrive at a new value for r.

Now, suppose it is absolutely necessary (because of instrumental limitations) to use an image of some definite radius, regardless of the problems an image of such size might introduce by way of increased exposure-times. Then, it is a simple matter to calculate from equation (3) the intensity of an image that size; after which, the necessary exposure-time may be found by examining the characteristic curve of the emulsion to be used.

It may be said that planetary photographers are divided into two camps; one advocates the use of large images and fast, low-resolution plates; the other advocates small images and high-resolution plates. Results seem to be equal in these two cases, since they require approximately equal exposure-times.

"Plate-scale" is a term that tells, for a given telescope, what linear size image will be formed of an object of given angular size. It is easy to determine plate-scale at a telescope's prime (or secondary) focus:

$$(4) \qquad \text{PS, in inches per degree} = \frac{F}{57.3},$$

where F = equivalent focal-length of telescope.

Unfortunately, the smaller amateur instruments yield planetary images at the direct focus that are far too small to be successfully photographed. Therefore, it is usually necessary to resort to magnifying devices such as the barlow-lens or the projection-camera. When a barlow lens is employed, plate-scale is arrived at by multiplying the primary plate-scale by the barlow's magnification factor. Plate-scale is more difficult to compute when using a projection-camera, whose workings I shall now review.

Most observers have noticed that when viewing a brilliant object such as the sun or the moon, a highly-magnified image may be projected back from the ocular onto a ground-glass or a sheet of paper. The projection-camera is, in essence, merely a rigid tube carrying (at opposite ends) an ocular (and often a camera-shutter) and a plate-holder. (Fig.2). It is not necessary to use a camera lens with such an arrangement.

The plate-scale of a projection-camera system is equal to the product of the telescope's primary plate scale, and the camera's magnification factor. The latter is given by the formula:

$$(5) \qquad m = \left(\frac{p}{f} - 1\right), \text{ where}$$

m = magnification factor of projection-camera;
p = distance from ocular to plate;
f = focal-length of ocular.

At this point I might mention the photographic materials with which I have had most success. Among the readily available commercial emulsions, I have found Kodak Royal Pan sheet film and Kodak Tri-X 35 mm. film to yield excellent results. I develop these two emulsions (which are nearly, if not completely, identical) in Kodak Developer D-11 for twelve to fifteen minutes at a temperature of approximately 75° F. Lower temperatures require longer developing-times, as determined by the manufacturer's time-temperature chart. Kodak Acid Fixer is a satisfactory hardening and fixing agent.

For photographs in blue light, I have used Kodak Wratten Filter #47; for the green, #58; for the red, #25 (A). These filters may be obtained in square gelatin sheets, or (preferably) as gelatin squares cemented between sheets of good-quality

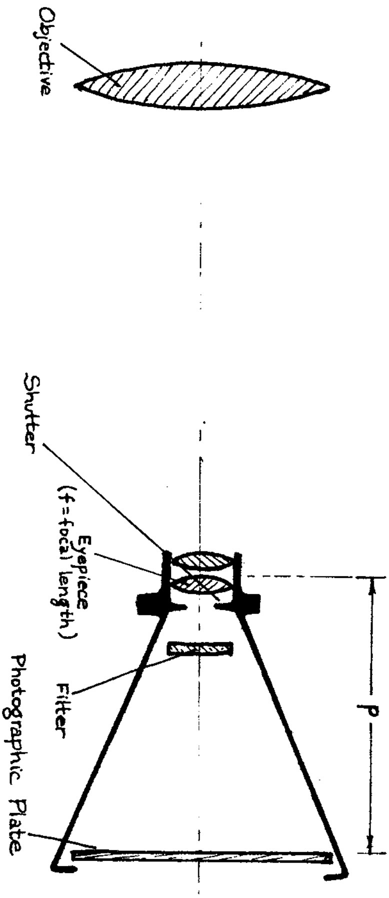


FIG 2: PROJECTION CAMERA

glass. When using filters, exposure-times must be increased by an amount that depends on the light-curve of the planet under observation, and the transmittance-curves of the individual filters. Approximate filter factors for Mars and Jupiter are given below:

FILTER FACTORS

	FILTER	MARS	JUPITER
red	25 (A)	4	-----
green	58	7	6
blue	47	9	3
orange	23 (A)	-----	3

Kodak spectroscopic emulsions are now available in 35 mm. rolls. I have not

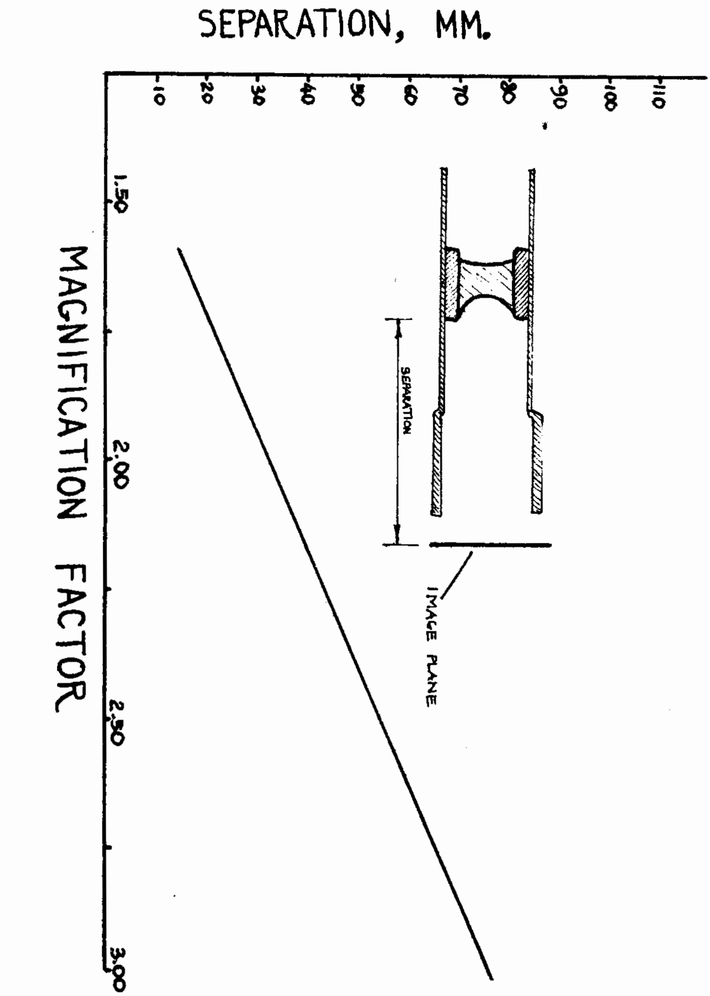


FIG. 3: MAG. FACTORS OF GOODWIN BARLOW LENS

attempted using these emulsions for planetary photography, but would highly recommend the trial of Spectroscopic Emulsion I-O for "blue" photographs, and Spectroscopic Emulsion I-E for "red" photographs. Probably planetary photographs in "blue" and "red" light can be made without the use of filters with these emulsions. I can see no advantage in using spectroscopic emulsions when it is not desired to isolate some region of the spectrum since the ordinary commercial panchromatic emulsions are generally "faster" over wide spectrum bands.

As for optical components: I use Brandon orthoscopic oculars--especially the 16mm. and 32mm. sizes--and a Goodwin barlow lens (see Fig. 3).

APPENDIX: NUMERICAL EXAMPLES

(1) It is desired to photograph Mars on the evening of September 1, 1956, with an eight-inch reflector whose constants are: F= 65"; T = 50% (refer to equations in

text for meaning of these and following symbols). From the Ephemeris, it is seen that on September 1, m = - 2.6; k = .99; radius (angular) = 12".3. A projection camera is available; its constants are: p = 13".5; f = 16mm. = 0".63. If more magnification is needed, a barlow lens, which has a magnification factor of 2, may be introduced into the system; in this case, p decreases (because of mechanical considerations) to 12".5. The fastest emulsion obtainable on this occasion is Kodak Tri-X Pan. Our usual limiting-magnitude is 6.0; on this night, however, it drops to 5.0.

It is first required to determine whether the extra magnification afforded by the barlow lens is required. We compute primary plate-scale with equation (4):

Primary PS = 65/57.3 inches per degree, or, .000314 inches per second.

Next, the magnification factor of the projection camera is computed (both with and without the barlow lens) from equation (5):

$$\text{(without barlow) } m = (13.5/.63) - 1$$
$$\text{(with barlow) } m = (12.5/.63) - 1$$

Overall plate-scale is equal to the product of primary plate-scale and all magnification factors; thus,

$$\begin{aligned}\text{(without barlow) PS} &= .000314 \times (13.5/.63 - 1) \\ &= .0064 \text{ inches/second;} \\ \text{(with barlow) PS} &= .000314 \times 2 \times (12.5/.63 - 1) \\ &= .012 \text{ inches/ second.}\end{aligned}$$

In the first case, the linear diameter of the image of Mars is:

$$\begin{aligned} d &= .0064 \times 24.6 \\ &= 0.16 \text{ inch;} \end{aligned}$$

in the second case,

$$\begin{aligned} d &= .012 \times 24.6 \\ &= 0.30 \text{ inch.} \end{aligned}$$

We decide to use the barlow because of the larger image afforded--with the reservation, of course, that exposure-times will not be prohibitive. The next step is to determine the intensity of an image 0.30 inch in diameter produced by our eight-inch telescope. By equation (3),

$$\begin{aligned} I &= \text{antilog } \frac{1 + 1.6*}{2.5} \times 8.5 \times 10^{-7} \times \frac{16}{1.0 \times .023} \times .50 \\ &= 11 \times 8.5 \times 10^{-7} \times 700 \times .50 \\ &= 3.3 \times 10^{-3} \text{ candle-meters.} \end{aligned}$$

It is now required only to determine t, which may be done through equation (2). From the characteristic curve of Tri-X Pan we find that a density of 0.8 requires log E = -2.3, assuming a developing procedure of 25 minutes in Kodak developer D-76 at 68° F. Thus,

$$\begin{aligned} -2.3 &= \log (3.3 \times 10^{-3}) - \log t \\ \log t &= 2.3 + \log (3.3 \times 10^{-3}) \\ &= -0.2. \text{ Therefore,} \\ t &= \text{approximately } 3/5 \text{ second.} \end{aligned}$$

(2) Object: Venus, May 12, 1956. From the Ephemeris, m = - 4.2; angular radius = 17 ".4; k = .31. Instrument: 15" refractor; F = 270"; T = 70 %. Primary plate scale, therefore, = .00131 inches/ second. Limiting magnitude on this night = 6.0. t = 1/25 second, in order to reduce blurring from "excursions". Problem: How

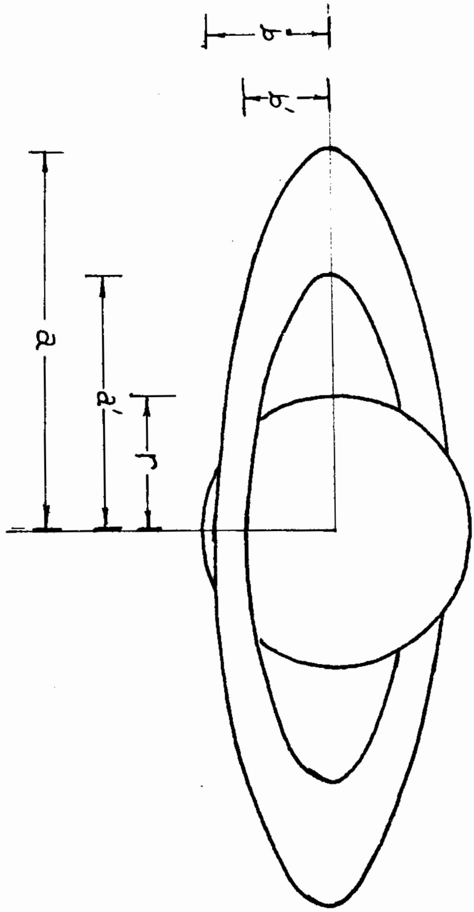


FIG 4: ANGULAR DIMENSIONS OF SATURN

large an image is necessary to effect a density of 0.8 on Kodak Royal Pan film; and what optical units are required in the projection camera to accomplish this?

By observing the characteristic curve of Royal Pan, we find that log E = - 2.2 renders D = 0.8, assuming a developing procedure as follows: Kodak Developer Dk60a, 68° F., 12 1/2 minutes.

Thus, by equation (2),

$$-2.2 = \log I + \log (1/25)$$
$$\log I = -.80$$
$$I = 0.16 \text{ candle-meters.}$$

Solving equation (3) for r:

$$0.16 = \text{antilog } \frac{1 + 4.2}{2.5} \times 8.5 \times 10^{-7} \times \frac{56}{.3r^2} \times .70.$$

$$0.16 = \frac{120 \times 8.5 \times 10^{-7} \times 190 \times .70}{r^2}$$

$$r^2 = (.014/.16)$$
$$r = 0.30 \text{ inch.}$$

This corresponds to a plate-scale of 0.30/17.4 = .017 inches/second. Since primary plate-scale = .0013 inches/second, the magnification factor of the projection camera must be .017/.0013 = 13. Therefore, by equation (5),

$$13 = (p/f - 1);\ \text{so that}$$
$$p = 14f.$$

Thus, if an ocular 32 mm. (1".26) focal-length is used, p must = 17".6; if a 16mm. (0".63) ocular is used, p must = 8".8.

(3) The next-to-last term in equation (3) does not hold true for Saturn, since its shape is irregular. For Saturn, revise equation (3) as follows, which gives good approximations (see Fig. 4):

$$I = \text{antilog } \frac{1 - m}{2.5} \times 8.5 \times 10^{-7} \times \frac{R^2}{ab - a'b' + r^2}$$
$$\times .01\ T.$$

(4) If filters are used, their factors must be incorporated into equation (3). In such cases, append the following multiplicative factor:

$$\frac{1}{X},\ \text{where } X = \text{filter factor.}$$

I would be happy to correspond with any observers interested in planetary photography; the material presented above is admittedly sketchy and imcomplete, due to lack of space. My address is 4320 45th St., N.W., Washington 16, D.C.

FOOTNOTES

1. Taken from Ephemeris, assuming a clear night, with limiting magnitude = 6.0. If the limiting magnitude is, say, 7, then we should insert m as one magnitude brighter than the Ephemeris value; if the sky is overcast so that limiting magnitude = 5.0, then m is considered as one fainter than the Ephemeris value. The limiting magnitude discussed here is assumed to be unaffected by city lights, but rather, only by true atmospheric conditions; when artificial lighting is involved, a planet may appear faint because it does not contrast well with the bright sky, whereas its actual brightness remains constant.

* See footnote (1). m_{lim} usually is 6.0, but tonight has dropped to 5.0. Thus, Mars appears not at the Ephemeris value of m = - 2.6, but at a corrected value of m = - 1.6.

PHOTOGRAPHS OF JUPITER

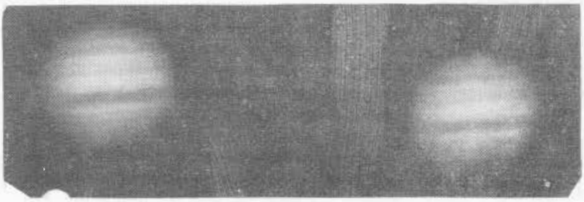
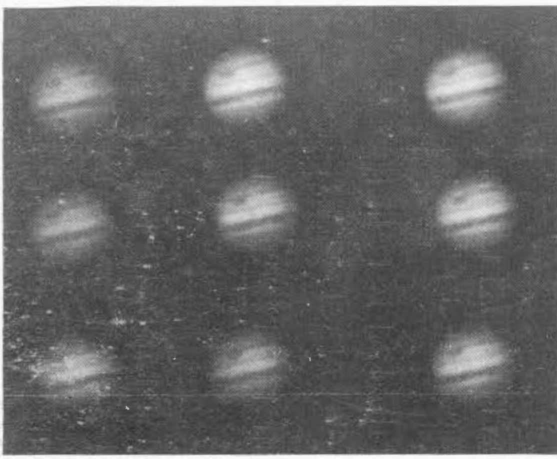


Figure 5

Date: January 5, 1955
U.T. : $3^h\ 20^m - 3^h\ 21^m$
8" f/8 reflector with projection camera
Film: Kodak Royal Pan; no filter
Development: 15 minutes, Dk-50
Exposure-time: approximately one second
"Seeing": 7-8

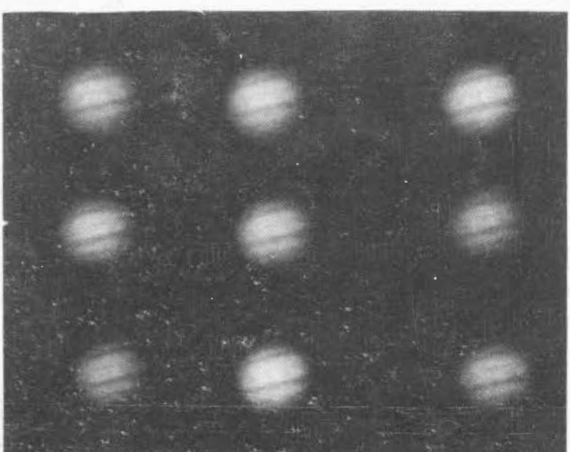
Figure 6

Date: February 19, 1955
U.T.: $1^h\ 5^m - 1^h\ 6^m$
8" f/8 reflector with projection camera
Film: Kodak Royal Pan; no filter
Development; approximately four minutes, D-8, diluted 2 parts developer to one part water
Exposure-time: two seconds
"Seeing": good to excellent



Date: February 9, 1955
U.T.: $2^h\ 17^m - 2^h\ 18^m$
8" f/8 reflector with projection camera
Film: Kodak Royal Pan
Filter: Kodak Wratten 47(blue)
Development: 3 plus minutes, D-8, diluted two parts developer to one part water
Exposure-time: two seconds
"Seeing": excellent

Figure 7



Date: February 9, 1955
U.T.: $2^h\ 56^m - 2^h\ 58^m$
8" f/8 reflector with projection camera
Film: Kodak Royal Pan
Filter: Kodak Wratten 23A (orange-red)
Development: 3 plus minutes, D-8, diluted two parts developer to one part water
Exposure-time: two seconds
"Seeing": excellent

(Compare no. 8 with no. 7; one was made in blue light, the other in red, showing the same area.)

Figure 8

THE ENCLOSED SOLAR PROJECTOR

by Kenneth L. Walko

Would you project slides or motion pictures out of doors in brilliant sunlight? Of course not. Most of the picture would be lost in the bright light. This is exactly what happens when the ordinary unprotected solar projector screen is used. You may argue that you can plainly see sunspots on a small projected image of the sun and you are right---still this is only a small part of the view possible under the proper conditions. It is possible for you to see the delicate sunspot penumbral structure, granulations of the photosphere, and bright regions where granulations and dark sunspots are absent.

To achieve these observational results you must use higher power, projecting perhaps an 18 inch disk, and project the image into a dark cavity. A light wooden box was made for this purpose. It had a hole in one end for insertion of the telescope's eyepiece and drawtube. A white cardboard screen was placed on the opposite end and the inner surfaces in the box were painted dull black. A hinged cover was mounted on the box in such a manner that it could easily be propped slightly open allowing the observer to peer into the box to observe the screen. Thus a bare minimum of extraneous light was permitted to enter, leaving the general interior of the box quite dark. The cover could be opened wide for focusing the eyepiece and making adjustments. A mount for a camera was also provided. The entire assembly was mounted on an 8 inch Newtonian telescope.

The view of the sun is vastly superior using this simple equipment. A 24 inch diameter disk (only a portion of which can be viewed on the screen at one time) reveals a wealth of detail here-to-fore unobserved by ordinary methods. Successful photographs have been made showing granules and sunspot structure.

For initial experimenting, an ordinary shoe box can be used. The results will be an exciting revelation to you interested solar observers. Making the enclosed solar projector will allow you to use your ingenuity in adapting the idea to your telescope. Try it-----

Postscript. Mr. Walko's address is 5101 Anthony St., Maple Heights, Ohio. He will welcome correspondence on the subject of this paper.

OBSERVING THE MOON - PAST AND PRESENT

by Patrick Moore
(Paper read at the A.L.P.O. Convention at Flagstaff on Sept. 1, 1956)

It is indeed a privilege to be asked to present a paper at the first Convention of the A.L.P.O. My only regret is that it has to be in absentia. There is nothing I would like more than to be present; unfortunately this is not possible, but I need scarcely add that I want to send the Convention, and everybody concerned with it, my best wishes for now and the future.

When Professor Haas was good enough to suggest my giving a paper, he suggested that I might say something about the recent formation of an International Lunar Society. I feel that this is best combined with a few remarks about earlier lunar work; so I would like to make a few observations on this theme, with apologies to those to whom I am merely repeating what has been said often before.

True selenography begins, of course, with the invention of the telescope. It seems that Galileo was the first to make a telescopic observation of the Moon, but he was not the only one, as is so often supposed. In Britain, more precisely at Traventy in Wales, Sir William Lower used one of the early telescopes in 1610 or 1611, and compared the Moon with a tart his cook had made: "Here a vaine of bright stuffe and there of darke, and so confusedlie all over". He also recorded the walled plains and other features seen by Galileo, and said that at the time of half moon he could see "the mountain-tops shining like stars". Very little is known about Lower; even the dates of his birth and death are uncertain, but at least his notes serve to show that he was taking an intelligent interest.

As telescopes were improved, knowledge of the lunar surface naturally grew. An exhaustive list of maps has been compiled by the eminent Spanish astronomer, Professor Antonio Paluzíe-Borrell, but in this brief survey I propose to deal only with the most important work. Before 1650, only one really interesting map was compiled, that of Hevelius, the Danzig city councillor who built an observatory on the roof of his house. The original copperplate of the map has been lost, and according to Paluzíe it was melted down and made into a teapot(!), but there are plenty of copies of the chart, and they are of definite value, though of course the accuracy is low judged by modern standards. Hevelius introduced a system of naming the various formations, usually after terrestrial features. However, the system was not satisfactory and only a few of the names survive. The map produced in 1651 by Riccioli introduced the modern method of naming features after famous personalities, and has stood the test of time. Riccioli's map was no better than that of Hevelius, but the chart of Tobias Mayer, published in 1775, was a vast improvement, and remained the best for over half a century.

Then, in 1779, Johann Schröter began work at his private observatory in Lilienthal, and continued until the destruction of his observatory by the invading French armies in 1813. He never produced a complete map, but he did make many hundreds of valuable drawings, published in two bulky volumes (all his unpublished observations were, unfortunately, destroyed). It is often said that his telescopes were useless, his draftsmanship crude, and his work of no value. I should like here to make an energetic defence of him. I have examined his observations most carefully, and the more I see of Schröter's work the higher my opinion of it. It is perfectly true that he was not artistic, but he seldom made a serious mistake, and it must be remembered that he was a pioneer-he could not draw upon the labors of others. Moreover, some of his telescopes were made by no less a person than Herschel, which disposes of the theory that they were useless. It seems to be the fashion to decry Schröter, but in my view the criticisms levelled at him are absolutely unjustified!

Following Schröter came Lohrmann, Beer and Mädler, and with the publication of the classic "Der Mond", with its accompanying map, we come to the start of the more modern era of lunar work. Mädler, the main observer, did virtually all his lunar work with a 3 3/4 in. Fraünhofer refractor, and his accuracy and eye for detail are truly amazing. There is no time here to discuss his labors in detail, but Mädler's work can never be forgotten.

Lohrmann, unhappily, died prematurely; his work was carried on by Julius Schmidt, a German who lived for much of his life in Athens. Schmidt's map was much more detailed than Mädler's, and was the result of many years of patient study. In 1876 came the first of the great English works, Neison's. I remember that when I started taking an active interest in the Moon, in 1935 or 1936, I was most surprised to find that Neison was still alive; but he took little further interest in the Moon after 1883.

The point I want to stress is that up to the 1870's, lunar work had been carried out entirely by individuals; Schröter, Mädler, Schmidt and the rest. There had been little attempt at co-operative work, and the pioneer association was the Selenographical Society, which was very active for a few years, and published a Journal which is of more than historic interest. Unhappily it died in 1883, following the death of its president, W.R. Birt, and the resignation of its secretary, Neison; but the seeds had been sown, and the Liverpool Astronomical Society carried on its work, with a lunar section directed by Thomas Gwyn Elger. When the Liverpool society too became inactive, the British Astronomical Association was formed; Elger was appointed director of its lunar section in 1890, the first year of the Association's existence, to be succeeded first by Walter Goodacre, then (for a brief spell) by T.L. Macdonald, and then again, up to 1956, by H.P. Wilkins.

The B.A.A. Lunar Section has done much valuable work. It has published Memoirs, charts and dozens of papers, and did a great deal to stimulate interest in the Moon. Its most active period has certainly been during the Wilkins regime. Wilkins took over the Section after the end of the last war, when to all intents and purposes it did not exist; he left it, a few months ago, over a hundred strong, publishing a quarterly periodical which compares with the old Journal of the Selenographical

Society.

Lunar, or partly lunar, societies began to appear in other countries: in the United States, in Germany, and in the Far East. Particularly notable has been the Association of Lunar and Planetary Observers. I say this not merely because I am a member of it, but as a plain statement of fact; as a society of observers (and I stress the word "observers"), it is more or less in a class by itself. Its field is comparatively restricted, which is in my view a very good thing. This is an age of specialization.

We have been, therefore, through three main periods of lunar history: the pioneer stage, the stage of individual work, and the stage of the work of national societies. We have also seen the production of reliable maps, beginning with Mädler's and ending with Wilkins'. The stage is set for the fourth stage; the stage of true international co-operation.

Obviously, national societies have their limitations, and it is for this reason that the new International Lunar Society has come into being. I am not sure who was the original prime mover; the United States, Britain and Spain were all concerned, but the idea is so obviously a good one that the problem must be not "Shall we do it?" but "How shall we do it?".

The vital points about the new organization are two. First, it will in no way supersede, or interfere with, existing societies such as the B.A.A. and the A.L.P.O. It will be the means by which national societies, as well as individuals, can exchange their news, pool their work, and get to know each other better. Secondly, it will be truly international in character. Of the first elected officers, one is an American (Professor Haas), one a Briton (Dr. Wilkins), one a Spaniard (Professor Paluzíe), and one a German (Herr Roth). And of these, only the office of Permanent Secretary does not change nationality each session.

We are still in the very early days of the new stage in lunar history. "Teething troubles" are bound to be encountered, but they cannot be serious; there can be no deep differences between men who have a common desire - the desire to learn more.

It is not my purpose to say anything about the organization or the precise form of the International Society. All I have done, or tried to do, is to give a brief sketch of the events which led up to its formation, and to stress the reasons why it has become so necessary. I have no doubt that the A.L.P.O. as a body, and its members as individuals, will do much for it; and I say again that it will help us to know each other even better than we do already.

Meanwhile, let me end by saying once more how sorry I am not to be with you, and by sending you my sincere good wishes both personally and for the success of the Convention. Good luck!

ORGANIZATION OF LUNAR AND PLANETARY OBSERVERS IN BROOME COUNTY, NEW YORK

by Phillip W. Budine
(Paper read at the A.L.P.O. Convention at Flagstaff on September 1, 1956)

It was in the summer of 1955 when I read in the local paper about an amateur astronomer, John Calabrisi, who had observed a total eclipse of the Sun and had some data published about the event. His address was included, so I being a "lone wolf" astronomer decided to look him up, and maybe then have a partner in astronomy.

We got together one day and got to talking about amateur astronomy; we wondered if we could find any more isolated amateurs who would join us and form a small club. In checking the local college we managed to find a man who had a couple degrees, was teaching Physics and who had taken a course in Astronomy at a college. His name was Silas Molyneaux and he was glad to join us. Mr. Molyneaux was a wealthy person and had much interest in our local museum, the Roberson Memorial Center.

The Center was made up of many educational societies.

Mr. Molyneaux, Mr. Calabrisi, and myself talked with the Director of the Center about forming an Astronomical Society. The Director, Kieth Martin, thought it was a very good idea; he said it would be the first of several scientific societies which would be formed. Also he said we would later have our own library of astronomical books and magazines.

So, in December, Mr. Molyneaux, Mr. Calabrisi, and myself met at the Center with seven others to discuss the future of an astronomical society. We developed a constitution of by-laws and amendments and set the date of January 1, 1956 for our first official meeting. The papers gave us much support in the publicity line.

At the first meeting forty people showed up consisting of a handful of experienced amateurs, the rest mostly beginners of all ages from eight to forty. Even a half dozen ladies were there, and they were quite serious about astronomy.

At this meeting many things were accomplished; our consitution was accepted, our meetings were to be held twice a month, on the 2nd and 4th Tuesdays, Mr. Molyneaux was elected President of our society which was to be officially called the Broome County Astronomical Society. Everyone thought Mr. Molyneaux was our man because he was an experienced teacher and had donated much financially to the society. The members appointed me as Head of the Board of Governors.

When the business had been taken care of, I was asked to give a report of my amateur work, as I was the only active amateur astronomer in Binghamton, New York at the time. Everyone found my notes and drawings very interesting, and this alone helped spark some people into observing the moon and planets. In my report I stated that lunar and planetary work was of actual scientific value in some respects and this is where many of the people had the wrong idea. So many people thought that nothing could be done along amateur lines in observing the moon and planets. Also people were astonished to know that they could acquire instruments at a reasonable price, or make their own with proper instruction. This is Mr. Calabrisi's place in the society; he had made a beautiful 6" refl. of 64 inches focal length in three months. He was appointed as Head of the Telescope Making Section of the society. Later on, our own A.L.P.O. member, Frank J. Kelly, was elected instructor of the Variable Star Observing Group.

A couple months had gone by and our general meetings had turned out very well. We had films and slides and many lectures, mainly because most of the members were beginners and needed some instruction. I gave many lectures on telescopes, observing techniques, and subjects of interest.

Many people had phoned me and wanted to know when an observing section would be started; you see, some members hadn't had any opportunity even to use a telescope. So after the next few meetings I set my $3\frac{1}{2}$" refl. up on the back lawn and the members viewed the Moon and Jupiter; this kicked off a big boom for lunar and planetary observing sessions, which in return paved way for the first official meeting of the Lunar and Planetary Observing Section of the B.C.A.S. (Broome County Astronomical Society). The meeting was held on April 17, 1956 at the Center; it was of much success. I was the instructor and chairman of the section. The section was the first active section and the largest, consisting of around nineteen members.

Now it is August; the section meets on the 1st and 2nd Tuesdays of every month. We have some equipment, but need more. We hope to have some 8" and 10" reflectors by the fall of next year because by then the telescope making section will have been in operation for about a year. At present our instruments average around 3 inches aperture but we have a few 6" reflectors and one 8" reflector. Most of our smaller instruments are refractors, Unitron being the most popular model.

I have in the past few months done my best to instruct the members, mostly beginners, in lunar and planetary observing techniques. Some members are quite educated astronomers but lack equipment for observing, but they are now starting to make their own instruments. Some of the younger members are very bright and catch on quickly to instruction; they will some day, I think, be very worthwhile lunar and planetary observers.

I want to thank Mr. Haas very much for his efforts in helping me and the section get started. The Strolling Astronomer has been of much help to the members of the section. Our section is now a member of the A.L.P.O. In the near future I hope that many of the members will be sending in valuable reports to the A.L.P.O. Many of the members appreciate Mr. Barcroft's and Mr. Haas' letters that they have received when they have written these officers of our A.L.P.O. The members and myself think that in the near future we will have a very well established lunar and planetary observing program in Broome County and will be contributing all we can to a wonderful organization, the Association of Lunar and Planetary Observers.

At this time I would like to express my regrets for not being able to attend this 1st A.L.P.O. Convention; business has me tied up. I want to thank Mr. Haas for asking me to present a paper at this convention, I also want to wish each A.L.P.O. member the best of seeing and I hope to see each one of you in the very near future.

BOOK REVIEWS

The Origin and History of the Earth, by Robert Tunstall Walker and Woodville Joseph Walker. The Walker Corporation, Box 1068, Colorado Springs, Colorado. 1954, 244 pp., 20 plates, 53 line drawings..........................$5.00.

Reviewed by William E. Shawcross

The Origin and History of the Earth is one of the most interesting books that has ever come to this reviewer's desk. In 244 pages the authors manage to give an excellent summary of atomic theory, present a new theory of the origin and history of the universe and particularly of the earth, and state an interesting view of man on the earth. Let us analyze in detail the manner in which they accomplish this remarkable feat.

The first chapter is entitled "Fundamentals," and in twenty very understandable pages the authors present a concise statement of the major aspects of atomic theory. Subjects treated include the fundamental particles, atoms, shell structure, isotopes, radioactivity, molecules, crystal structure, and the forms of matter. With this information available, the authors next describe "The Constitution of the Universe", a chapter dealing with the relation of the parts of the universe one to another. The topics in the first part of the chapter are stellar spectra, multiple star systems, the Milky Way, nebulae, galaxies, and the red shift. The second part discusses the origin of the universe. The first theory, that it has evolved from simpler forms of matter to more complex forms, is discarded in view of the Second Law of Thermodynamics and in favor of the authors' own Devolutionary Hypothesis.

The main features of this hypothesis are that the universe began with all matter concentrated into one central mass; this mass exploded and that the smaller fragments so produced flew outward from the center; that these fragments disintegrated into galaxies and that tidal distortions of the fragments produced the spiral arms which then disintegrated into the stars. Here the process is assumed to have stopped because the pieces are now small enough to be relatively stable. Why this should be so is one unexplained point that weakens the argument; one might expect the process to continue until nothing but dust remained. The masses forming the stars are now supposed to have begun to disintegrate, forming a thick cloud of heavy atoms near it, lighter atoms farther out. The high density of Sirius B is cited as evidence for this view. The final topic is a brief mention of cosmic rays, which are assumed to be heavy nuclei that have been ejected from the cores of stars into space.

The major portion of the remainder of the book is devoted to explaining what we know about the earth in terms of the Devolutionary Hypothesis. Chapter three treats "The Constitution of the Solar System". The features of the system are discussed and a list of facts which must be explained by any theory of the origins of the system is presented. The traditional theories are discarded in favor of the authors' theory. The manner in which the system is thought to have originated is sketched out and the behavior of the sun -- past, present, and future --analyzed. The question of life on other worlds is treated as a concluding topic. The main point of interest in this chapter is that the planets are said to have a small core of the original dense material at their centers, and that this material is still decomposing and hence the planets are expanding.

The earth is now discussed in detail. The chapters are: "The Constitution of the Earth," dealing with the physical description of the planet, earthquakes, and the origins of the planet's heat; "The Cause of Vulcanism and Orogeny," discussing the observed physical effects and discarding the theory of a shrinking earth in favor of an expanding one; "The Phenomena of Vulcanism and Orogeny," an ample outline of igneous geology containing applications to lunar features; and "The History of the Earth," the concluding chapter, outlining briefly the topic of historical geology and ending on a note of the future of man and his home planet. A list of acknowledgements and an index round out the volume.

The authors have obviously not been too concerned with cost in the production of this privately printed book. The format is excellent, the paper used is art paper, and the half-tones are printed with a very fine screen. The line drawings show that a tremendous amount of care was used in their preparation. From a literary point of view the organization is careful, though the style tends to be somewhat didactic. Excellent use is made of vivid comparisons to help the reader grasp the significance of many of the statements, a feature much needed when dealing with very large or small figures and quantities.

One cannot be so kind when it comes to the matter of the physics and the astronomy cited in the book. The physics is quite definitely dated as that of about 1945. The naivete of the view indicates that the information was probably gathered by reading, rather than by an intensive course in the subject. The same must be said for the astronomy. The major source of material was the 1945 edition of the Russell-Dugan-Stewart ASTRONOMY. There is only a footnote describing the doubling of the astronomical distance scale; figures quoted in the text are the 1945 values. There are two statements that might cause some debate among astronomers. The first of these is that Mercury has no atmosphere -- something completely open to question; the other is an implication that the temperature of matter completely devoid of an internal heat source would be absolute zero, something which is not so. These were the only touchy points that caught this reviewer's eye.

The crux of the whole book is the authors' conviction that the earth is expanding rather than shrinking. Both of these authors have had many years of experience as field geologists, and one might suspect that they knew how to read the evidence. With this idea in mind, this reviewer sought the opinion of Dr. Virgil I. Mann of the University of North Carolina Department of Geology. Dr. Mann's comment was that all of the evidence that he had seen supported the view that the earth is shrinking, and he went on to add that field geologists often get strange ideas due to their long separation from geological theory.

The Origin and History of the Earth is well worth reading, but the neophyte in geology should beware the infectious quality of the unorthodox views that it presents.

******

Earth Satellites, by Patrick Moore. W.W. Norton and Co., Inc., New York, 1956. 157 pages. Illustrated by Irving Geis. $2.95.

Earth Satellite, by Patrick Moore. Eyre and Spottiswoode, Ltd., London, 1955. 128 pages. 15 shillings.

Reviewed by Walter H. Haas

These are the American and the British versions of another book from the pen of our talented English colleague, Patrick Moore. The books are written with Mr. Moore's usual facile and most readable style. They can certainly be recommended to the beginner or to the more advanced student desiring a reference book of a popular kind. We rather wonder why they were not called A Guide to the Earth Satellite, for Mr. Moore here again is a most genial guide to his readers. The books were evidently motivated by the White House announcement on July 29, 1955 that the United States would launch a number of small, unmanned, artificial satellites during the coming International Geophysical Year, from July,1957 to December, 1958. Earth Satellite was published on October 31, 1955, a very nimble job of writing. There is little to choose between the British and American books, except that the latter is far more abundantly illustrated. A few of Mr. Geis's illustrations, however, impressed the reviewer as primarily material for science-fiction fans.

Earth Satellites begins with five chapters giving a description of the satellite program and a historical summary of high altitude research and rocketry. The author properly stresses that the first satellites will primarily give us information about our own earth. Due credit is given to such great pioneers as Ziolkovsky, Goddard, and Oberth. Chapters 6 to 9 discuss present concepts of orbital vehicles, Project Vanguard, possible research with unmanned satellites (the author mentions studies of the sun's ultraviolet spectrum, cosmic rays, and micrometeorites), and possible military uses of such bodies (the author considers these uses unimportant). Chapters 10 to 14 are admittedly speculative; Mr. Moore successively considers manned satellites, flight to the moon, and flight to Mars and Venus. He suggests, with proper reserve, that we may reach the moon in the twenty-first century and Mars in the twenty-second.

The two books are reliable enough and free of serious errors. The reviewer did notice a few slips; for example, meteorites are not just "drawn 'downwards' by the Earth's gravitational pull" (pg. 24 of Earth Satellites) but rather primarily collide with the earth and its atmosphere when the two bodies arrive simultaneously at the intersection of their orbits.

We shall conclude this review with Mr. Moore's concluding paragraph: "All great experiments have humble beginnings. Aeronautics began with kites, with balloons; and with the clumsy machines developed by the Wrights, yet within forty years of the first proper ascent in a powered craft we had learned enough to soar to heights of many miles. The parallel is obvious enough, and we cannot doubt that the launching of the unmanned satellite will be a prelude to a new phase in the story of mankind."

Two worthwhile books.

****

MERCURY IN APRIL-MAY, 1956

by Owen C. Ranck

More observations were received for the April-May, 1956 apparition of Mercury than for any other since I have been Recorder. Three observers contributed a total of 11 observations. I was among the unfortunate ones, due to the bad weather we have been having in Milton all summer. Those who contributed were:

Observer	Telescope	No. Observations	Location
Walter H. Haas	6-inch refl.	6	Las Cruces, N.M.
David Meisel	8-inch refl.	4	Fairmont, W. Va.
Brian Warner	3-inch refr.	1	Crawley Down, Sussex, England

I shall attempt to compare the material at hand and to take each feature of the small planet in order.

Figure 9.

Mercury.
Brian Warner
May 1, 1956.
$20^h 15^m$, U.T.
3-in. refr. 220X.

Figure 10.

Mercury.
Walter H. Haas
May 8, 1956
$2^h 32^m$, U.T.
6-inch refl.
298X.

The Cusps. In all cases, except one, both cusps were recorded as brighter than the general surface of the planet. Mr. Brian Warner just recorded the limb bright all the way around from cusp to cusp, with no brighter areas (Figure 9). Haas in all his drawings shows the cusps as brighter than the general surface and separated from the rest of the disc by a dark bordering band (Figure 10), which no doubt is Persephones to the south and an unnamed feature to the north, according to O'Toole's map of Mercury in The Strolling Astronomer, October, 1951, Vol. 5, No. 10. Antoniadi's standard map gives a dark area, Aphrodites, but not in this position. Meisel found this feature as a very thin line on May 9.

The Limb. Haas recorded the limb to be brighter than the main part of the disc, as did Warner, and Meisel on May 8.

The Dark Areas. Haas recorded Criophori, Aphrodites, and Atlantis all dark. Warner drew what I interpret as Phoenicis, but he recorded this feature to be larger than shown on maps, and very dark.

The Bright Areas. It seems that none of the three observers found any of these areas except that Haas recorded a very small one on the northwest limb. It was Argyritis.

Anyone who observed Mercury in September, 1956 is urged to submit his work as soon as possible. We shall hope for better weather with Mercury in the future.

****

THE W.A.A. - A.L.P.O. CONVENTION AT FLAGSTAFF, Aug. 29-Sept.1, 1956

by Walter H. Haas and Beryl Haas

The Western Amateur Astronomers held their Eighth Annual Convention at Flagstaff, Arizona on August 29-31, 1956. The Association of Lunar and Planetary Observers held its very first Convention at the same place on September 1, 1956. Special praise must go to the Convention Committee of Thomas R. Cave, Jr., Thomas Cragg, George Perkins, and Les Mawhinney for the work and planning which went into holding a meeting hundreds of miles from the home of any amateur astronomy society. (Exactly one amateur astronomer from Flagstaff attended!) Dr. Albert G. Wilson, Director of the Lowell Observatory, and his staff were extremely helpful in many ways. We of the A.L.P.O. must also expecially thank our good friends in the W.A.A. for making our first Convention possible, an event which might otherwise have been deferred for many years. Of course, Flagstaff and the Lowell Observatory have long been regarded as the shrine of Martian research; and Mars only a week and a half away from a very favorable opposition was a stellar attraction of the meetings. It is a measure of the success of the Convention that no one complained much about the lack of detail on Mars, a result both of bad seeing in our own atmosphere (yes, even at Flagstaff) and of abnormal widespread obscurations in the atmosphere of Mars.

There were about 250 registrants for the W.A.A. Convention and about 120 for the A.L.P.O. The latter total was certainly personally very pleasing for the fourth day of a meeting and for the Saturday just before Labor Day. It was, as usual, very good to meet old friends and to make new ones. The informal contacts made at such gatherings are among the most pleasent of memories.

The formal program of the W.A.A. consisted of sessions for papers at the Flag-

Figure 11.

Dr. Otto Struve,

Receiver of the G. Bruce Blair Award in 1956, at the W.A.A. Convention at Flagstaff.

Figure 12.

John Westfall.

Speaking to A.L.P.O. Convention at Flagstaff.

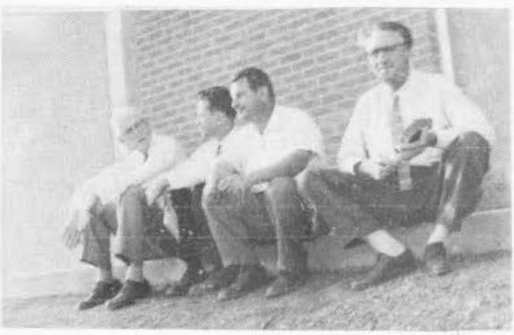


Figure 13.

Group at Meteor Crater Museum During W.A.A. Convention.
Left to Right: Dr. Dinsmore Alter, Walter H. Haas, Thomas R. Cave, Jr., and George Carroll.

Figure 14.

Dr. James Q. Gant (left) and Thomas Cragg at Meteor Crater During W.A.A. Convention.

staff High School on August 29, 30, and 31. These papers were really good, in our opinion; and we shall mention some of them to indicate the scope of the program. Dr. Albert Wilson spoke on "The Lumicon," which is still in a developmental stage. Eugene Larr in "Micrometeorites in Your Own Backyard" described simple collecting which many of us might profitably undertake. Dr. Dinsmore Alter of the Griffith Observatory in "The Moon" gave an extremely instructive talk on his interpretations of the lunar surface features. Dr. Armand Spitz told what amateurs can do in "Project Moonwatch." The Smithsonian Astrophyscial Observatory Bulletin No. 3 for Visual Observers of Satellites is reproduced in this issue. Dr. Spitz's witty and instructive talk was one of the highlights of the Convention. Mr. Clyde Tombaugh in "Mars" outlined his geological interpretations of the face of the Red Planet. Mr. Charles A Federer, the Editor of Sky and Telescope, gave a talk, with slides, upon "English Observatories." Other worthy papers we must pass over for lack of space. The program somehow made room for visits to Meteor Crater and to the Naval Observatory Station near Flagstaff. In addition, many attendees visited Dr. H.H. Nininger's American Meteorite Museum at Sedona, Arizona, upon his gracious invitation.

The evenings also were full. On Wednesday, August 29 there was a Star Party on Mars Hill. Dozens of telescopes of all sizes and kinds were set up near the 13-inch dome. The sky was very clear, and people slowly wandered from telescope to telescope. Later in the evening, the Lowell Observatory staff provided some most welcome warm refreshments and exhibited Mars in the 24-inch with the lumicon attached. On Thursday, August 30 the Convention Banquet was held. Mr. H.A. Wallace, Chairman of the Board of Directors of the W.A.A., presented the G. Bruce Blair Award to the distinguished astronomer, Dr. Otto Struve. In his acceptance speech Dr. Struve told something of the history of his astronomically famous family and of the first stellar parallax determinations, in which his ancestor, F.G.W. Struve, was very much involved. On Friday, August 31 there was a second Star Party, this time at the Flagstaff High School.

The following papers were presented at the A.L.P.O. Convention on September 1:

1. Introductory Remarks, by Walter H. Haas.
2. Filter Techniques for Visual Observation and Photography of Planetary Detail, by C.F. Capen, Jr.
3. Some Results of Tests of Screen-Type Apodizing Masks, by Arthur Leonard.
4. The Marsitron Hypothesis, by Donald L. Cyr.
5. Venus, the Unknown Planet, by James C. Bartlett, Jr. Read by Oscar Monnig.
6. The Uranus-Neptune Section Report No.1: Plans for 1957, by Leonard B. Abbey, Jr. Read by Thomas R. Cave, Jr.
7. Current and Proposed Observations of Saturn, by Thomas Cragg.
8. Modern Selenography, by H.P. Wilkins. Read by James Q. Gant, Jr.
9. The Moon and the Amateur Astronomer, by David P. Barcroft.
10. A Suspected Very High Lunar Mountain, by John E. Westfall.
11. Observing the Moon-Past and Present, by Patrick Moore. Read by Carl Wells.
12. On the Prospects for Success of the A.L.P.O. Lunar Meteor Search, by Steadman Thompson. Read by W.L. Minear.
13. Organization of Lunar and Planetary Observers in Broome County, New York, by Phillip W. Budine. Read by Harold Milner.
14. Some Basic Procedures in Planetary Photography, by P.R. Lichtman. Read by Paul Bevis.
15. Some Immediate Goals of the A.L.P.O., by Walter H. Haas.

We thank the contributors of these papers and also those persons who read papers for authors too distant to attend. We are also obliged to Dr. Gant, who served capably as Chairman of the afternoon session for papers. Some of the papers given have been published in the present or the immediately previous issue of The Strolling Astronomer, and we hope to publish most or all of the remaining papers in future issues. Of the pictures on pg. 91, Figures 11 and 12 were taken by Mr. Jack Eastman of Manhattan Beach, Calif., to whom we express our thanks; and Figures 13 and 14 were taken by Beryl Haas. There are additional pictures, including the Convention group-photograph, in Sky and Telescope for November, 1956.

The Western Amateurs will hold their 1957 Convention on the campus of the University of California at Berkeley. The A.L.P.O. has yet made no definite plans for a 1957 Convention. With your continuing help, however, we are sure that we can hold another successful and enjoyable meeting, and we should certainly do something in honor of the Tenth Anniversary of our founding.

A NOTE ON THE LUNAR FORMATION LINNÉ EXPRESSING SOME EVIDENCE IN FAVOR OF THE REJECTION OF THE CONCEPT OF CHANGE THERE

by Richard M. Baum

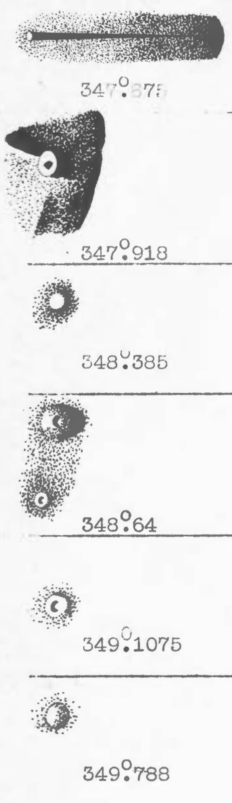
The circumstances attendant at the celebrated 1866 announcement by Schmidt of the apparent effacement from the lunar surface of the small ringwall called Linné, situated on the eastern reaches of the Mare Serentitatis, are of course established platitudes of selenographic history. Regard for the overwhelming evidence adduced in support of this event leaves us little room but to express our conclusion, that in this region sometime anterior to 1866 some action robbed the formation of its former aspect to the extent of reducing it to no more than a mere depression, out of which was later watched the Spinx-like rising of a small crater-cone surmounted by a minute summit orifice. These broadly are the facts of the case.

Now it is a matter of no small wonder that despite his former interest in lunar matters, Maedler did not participate in this great discussion. However, it is not true as Moore has asked, "What Maedler's own views were is unfortunately unknown." (Guide to the Moon, London, 1953, p. 48; American edition, p. 58). It is a matter of no common knowledge that at the meeting of the British Association, held at Norwich in 1868, Baron von Maedler, as he then was, delivered a long and invaluable paper entitled "ON CHANGES OF THE MOON'S SURFACE", in which he summarised his latter day opinions on this perennial subject. Importantly, he pronounced in favor of the continued operation of forces powerful enough to work vast, observable changes on the lunar surface; thus he reversed his earlier interpretation as to lunar surface conditions. Maedler's paper was printed in full in two leading British journals, but despite this was soon forgotten and its existence ever since completely unknown.

Historically this work is of the utmost value, but it has a more practical application for towards the close Maedler writes, "My eye, which has undergone an operation for cataract, will no longer permit me to make accurate and special continuous observations, yet on May 10, 1867, I attempted an observation on the crater Linné, in the heliometer of the observatory at Bonn. I found it shaped exactly, and with the same throw of shadow, as I remember to have seen it in 1831. The event, of whatever nature it may have been, must have passed away without leaving any trace observable by me." (Astron. Reg. 6.p. 241, 1868).

Now this perplexes us; for in blindly accepting a mass of data which screams of a perceptible change having occurred, such an intriguing remark as this has been overlooked. It is evident that Maedler believed the change a temporary affair and one not producing any alteration in the structure of the formation. We find too by examination of observations made immediately after the communication by Schmidt had been generally made known, that some English observers actually described Linné thus, "....., but the impression given was, that the hill was either very low and rounded, or if not low, that the sides are of very gradual ascent." (Astron. Register. 6. 1868. p. 20). The Italian observer Tacchini remarked upon a similar aspect and described as at the center a small black spot. Now some authorities have claimed that since 1866 a change has further taken place, but comparing these accounts with present day studies with larger telescopes (the above observation was made with a 6-inch refractor) reveals the analogy to be exact and complete, and that again if any change has occurred it has left no trace.

It seems that a useful piece of work would be the examining of Linné under oblique lighting with apertures akin to those initially used before any change was suspected, and the noting carefully of all the transformations it thereby undergoes. In this matter the sketches appended to this note in Figure 15 will no doubt prove



R. M. Baum.
April 9d 19h 30m. U.T.
4.5-in. O.G. x230
Se=3/10 : Tr=3/5.

C. D. Reid.
April 9d 19h 35m. U.T.
9-inch. refl. x240
Se=4+.

E. G. Williams.
April 9d 20h 30m. U.T.
6.5-in. refl.x124
Steady air.

G. R. Finlow.
April 9d 21h. U.T.
8-in. Cass. x200
Steady air.

C. D. Reid.
April 9d 21h 55m. U.T.
9-in. refl. x240.Se=3+

R. M. Baum.
April 9d 23h 15m. U.T.
4.5-in. O.G. x230.
Se = 4

FIGURE 15

VARIOUS ASPECTS OF LINNÉ IN DIFFERING APERTURES UNDER OBLIQUE ILLUMINATION. 1954 April 9th.

Fig. 16. Group of A.L.P.O. Members at the National Convention of the Astronomical League in Miami, Fla. July 1-4, 1956. Left to right: David Meisel, Ed Bailey, Steadman Thompson, R.L. Graham, D.L. Albritton, L.B. Abbey, Jr., W.E. Shawcross, Bob Wright, E. D. Funck, Leon H. Stuart, and James Q. Gant.

of some stimulus. They were all made at Chester, England, by observers working quite independently, and unknown to each other. The telescopic aperture ranged from 3-to 9 inches. It is obvious that the drawings need no explanation, and demonstrate exactly just how easily one can fall into error into such matters as interpretation of dissimilarity of delineations as evidence of change.

OBSERVATIONS AND COMMENTS

A.L.P.O. Members at League Convention.

Figure 16 shows a group of our members at the Miami Convention of the Astronomical League. The photograph was taken by J.M. Martin, Key West, Fla. and has been submitted to us by Leonard B. Abbey, Jr. This group represents, we understand, the first organized meeting of members of the A.L.P.O. in the history of our organization.

Chart of Plato. Figure 17 on pg. 95 should convince the most skeptical Doubting Thomas that lunar and planetary work of a high degree of excellence can be carried out with very modest instrumental means by talented and persevering amateurs. The outline of Plato used here was traced from an enlargement of Mount Wilson Photograph H 8, but otherwise the chart is entirely Mr. Reese's own work. It will bear comparison, we think, with the best available drawings and photographs of this popular and rather enigmatic walled plain. The nomenclature of this chart is being used in this periodical in discussions of Plato. The near-central craterlet A is much the easiest object on the floor. Craterlets D_1 and D2 are often seen as one, especially with poor seeing or small apertures. With

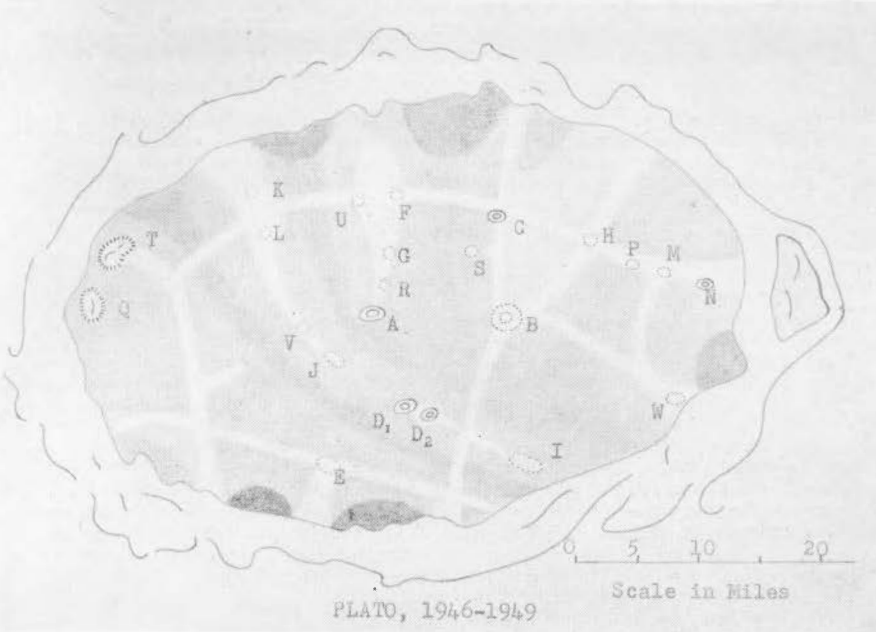


Figure 17. Chart Drawn by Elmer J. Reese from Observations with a 6-Inch Reflector.

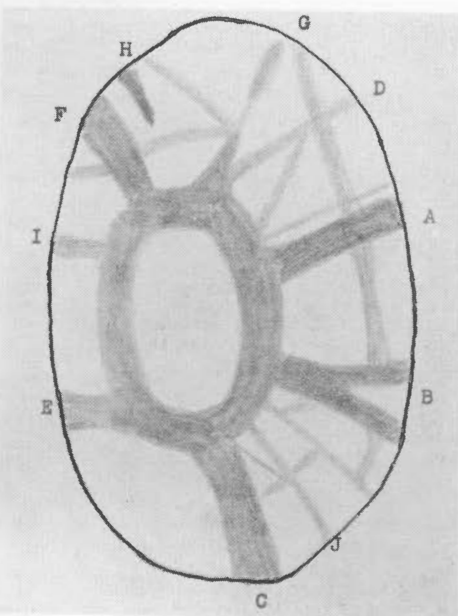


Figure 18. Chart of the Radial Dark Bands in the Lunar Crater Aristarchus by J.D. Bostwick. October, 1956. 12-inch Reflector. 280 X, 340X.

high solar lighting A,B,C,D_1, and D_2 are the easiest bright spots on the floor, other markings usually being rather difficult.

Aristarchus. Mr. John D. Bostwick, Iddesleigh, Hartington St., Leek, Staffs., England has contributed a chart of the system of dark wall bands in Aristarchus (Fig. 18). He urges that it be compared with E.J. Reese's chart, Figure 24 on pg. 35 of our March-April, 1956 issue. (It should be noted that Mr. Bostwick mapped only the dark bands; Mr. Reese mapped all detail.) For ease of comparison Mr. Bostwick has adopted Mr. Reese's nomenclature for Aristarchus.

Mr. Bostwick writes that he has been studying Aristarchus for many years and that Figure 18 was completed in almost perfect seeing on October 18, 1956. He remarks: "Reese seems to have seen many of the bands but he does not show the ones which I saw running diagonally between the larger bands; perhaps these are beyond even his telescope and excellent conditions." Bostwick hopes that Figure 18 will make more observers study Aristarchus and lunar wall bands, a hope which we certainly share.

Herodotus Pseudo-Peak. Dr. James C. Bartlett, Jr. writes that the curious apparent central peak in Herodotus was seen with complete certainty on November 15, 1956 at colongitude 55°3 but that not a trace of it could be found on November 16 at 68°5. He was probably using a 5-inch reflector. We wonder whether any of our other readers observed Herodotus on either of these two dates, and if so, with what results.

Leonard B. Abbey, Jr. drew Herodotus with an 8-inch reflector on April 23, 1956 at colongitude 62°1. He saw no hint of any central bright spot or peak, and his drawing somewhat resembles E.J. Reese's drawing at 59°9. on September 10, 1954 (Fig. 9 on pg. 95 of the July-August, 1954 Strolling Astronomer).

Linné. Leonard Abbey secured drawings on March 20 and 21, 1956 at colongitudes 5°9 and 18°6 respectively, employing an 8-inch reflector at 380X. On March 20 he drew the craterlet lying well to the east of the center of a diffuse surrounding white area and nearly full of shadow. On the next night the craterlet held a crescentic shadow, while the west part of the white area was now the dullest part. The diameter of the craterlet was apparently about one-fourth of the diameter of the white area. The Editor suspects that the rather high power used by Mr. Abbey was a definite advantage in resolving the small details here involved.

The Ephemeris. Every active lunar and planetary observer who has not already done so should order at once the 1957 American Ephemeris and Nautical Almanac. It may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., the price of the clothbound edition being $4.50--an unfortunate increase since last year. The Ephemeris will certainly make observing more interesting; for tables in it permit the easy computation of the central meridian of longitude on Mars and Jupiter and the colongitude of the moon, for example. Other portions of it of especial value to lunar and planetary observers give such information as data on the satellites of Jupiter, Saturn, Uranus, and Neptune, the daily right ascension and declination of the sun, the moon (here hourly), and the bright planets, the phases of Mercury and Venus, times for sunrise, sunset, the beginning of dawn, and the ending of twilight, the values of the lunar librations at daily intervals, the angular diameters of the bright planets, etc. Once you begin to use the Ephemeris to make your lunar and planetary studies more purposeful and more meaningful, you will certainly never want to be without it.

Eratosthenes. Mr. Phillip W. Budine, 102 Trafford Road, Binghamton, New York made a drawing of this ring-plain with a 3-inch Unitron refractor on July 17, 1956 at colongitude 19°6. This early morning view is certainly creditable for so small an aperture. The drawing shows terraces on the south and east inner walls, a duskiness of the south inner wall (because very obliquely lighted?), a ridge or valley (revealed as a dusky line) near the foot, and parallel to, the northeast inner wall, three central peaks, and one peak and one bright spot of uncertain nature in the south part of the floor. Several brilliant spots on the east rim are presumably peaks, and shadow irregularities demonstrate the existence of several peaks on the west rim. A dusky spot near the foot of the south inner wall may be an early stage of one of the high-sun dark areas. The north inner wall is very dusky. Two long bright streaks at the foot of the northeast and east inner walls may be ridges reflecting sunlight.

After completing his drawing, Mr. Budine compared it to the 200-inch photograph of this area--an excellent practice.

New Jupiter Recorder. Mr. Robert G. Brookes, who has served us very well as Jupiter Recorder, recently had to enter a hospital for expected prolonged treatment. We join in wishing him a speedy recovery and hope that he can soon resume his leadership of the Jupiter Section. Meanwhile, we have been obliged to find a new Jupiter Recorder. Mr. Henry P. Squyres, 3608 N. Durfee, El Monte, Calif. has kindly agreed so to serve. All observations of Jupiter should now be sent to Mr. Squyres, who is one of our active young observers. We especially hope to investigate further the apparent relations between radio emissions from Jupiter and visual surface features.

SMITHSONIAN ASTROPHYSICAL OBSERVATORY

BULLETIN FOR

Visual Observers of Satellites

NUMBER 3 60 GARDEN STREET, CAMBRIDGE 38, MASS. NOVEMBER, 1956

MOONWATCH Preparations Swing Into High Gear

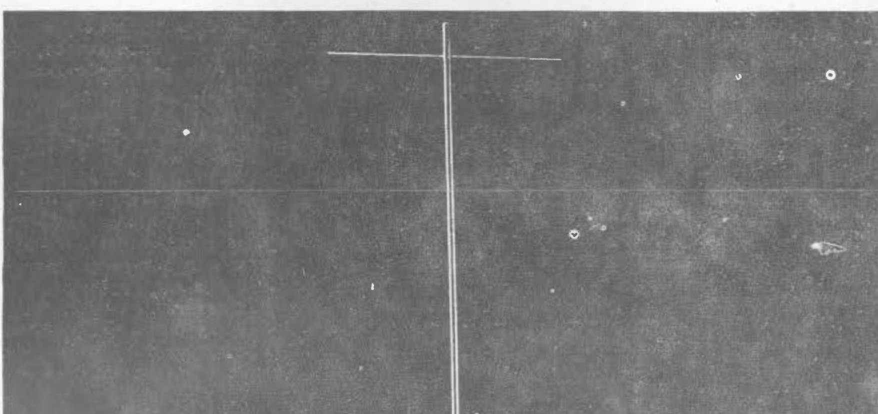
Volunteer satellite observers are speeding up efforts to organize their stations and to equip and train their teams. The emphasis is on immediate readiness to go into operation in observing artificial satellites, simulated or real.

The first major spur to this activity was the announcement that the first nationwide satellite alert would be held between Thanksgiving and Christmas (*Bulletin* No. 2). The second development came in mid-September at the Barcelona conference of the International Geophysical Year. There Dr. Sydney Chapman, president of the Special Committee for the IGY, announced that the United States and the Soviet Union are co-operating in their plans for artificial satellites, and that similar instruments and techniques would be used for tracking both American and Russian satellites.

An international network of MOONWATCH stations may soon be a reality. At Barcelona, each IGY country concerned was asked to appoint a co-ordinator for satellite observations. And at its Rome congress, the International Astronautical Federation volunteered its co-operation and facilities in establishing MOONWATCH stations in many countries. In particular, Sr. T. Tabanera, of Buenos Aires, heads an ad hoc committee to expedite MOONWATCH programs in the IAF. Through his kindness, also, each *Bulletin for Visual Observers of Satellites* will be translated into Spanish.

From coast to coast, interest in the observing program is steadily growing. More teams are needed, especially in the western part of the United States.

ARMAND N. SPITZ
Coordinator of Visual Satellite Observations



The general appearance of the line of observers, their instruments, and the central mast to mark the meridian, is seen in this model constructed by Frank McConnell.

VI. Information for Station Leaders

A. Simulated Satellites. For the first observing alert in late 1956, an artificial satellite actually in its orbit will not be needed. A number of the observing stations (selected at random) may be able to see a simulated satellite, according to plans now under way. These simulated satellites will be airplanes flying at an altitude that will make their motors inaudible, with a course and speed approximately duplicating the apparent motion of an artificial satellite. Each plane is to carry a light that will match the expected brightness of the satellite, as seen from the ground.

The proposed flights would be made over only a few stations during the alert, but whether or not a simulated satellite passes over a station will not affect the value of the observing test. The purpose is to evaluate the teams already registered with the Smithsonian Astrophysical Observatory. Professional astronomers and other official representatives of the coordinator will study the MOONWATCH volunteers in action. They will report to the coordinator on the station layout, instruments, training, and particularly the observational methods of each group.

An analysis of the reports from all stations—whether or not a simulated satellite has been observed—should give the coordinator valuable information about the efficiency of each group. Scientifically reported, businesslike operation of a station with negative observing results will be more creditable than a poorly organized report of the passage of a mock satellite.

The first alert will be held in the late afternoon, spanning the evening twilight hours. About two weeks advance notice will be given. Later alerts will take place on shorter notice, some of them in predawn twilight. Instructions on communications techniques will be distributed in advance.

B. Recommended Optical Equipment. The prototype MOONWATCH station was established at Silver Spring, Maryland, at the home of G. R. Wright, chairman of the national advisory committee. There technically skilled amateur astronomers assisted Mr. Wright in systematic tests of about 30 different optical instruments that had been proposed for visual tracking of artificial satellites. (General requirements for telescopes to be used at MOONWATCH stations were described in *Bulletin* No. 2.)

It was concluded that the instrument described in the following section of this bulletin by R. H. Dellar met the requirements as well as any telescope that could be constructed at reasonable cost. The prototype instrument, made by Hoy Walls, Washington, D. C., has an unusually large field and great brilliance of star images. Telescopes differing from this in only minor details were independently devised by Arthur S. Leonard, Davis, Calif., and Roy N. Griffin, Los Altos, Calif.

Whether a monocular or binocular is better for satellite observing is often asked. The question has been submitted to numerous experts, whose unanimous decision is that a monocular is almost as effective as a binocular having the same field, aperture, and magnification. Wide-angle binoculars meeting the observing specifications are generally unavailable and would be costly; therefore the question seems settled in favor of monoculars for MOONWATCH teams.

C. Station Sponsorship. In many communities, obtaining the equipment required for the operation of a MOONWATCH station is a major problem facing observing teams. Some amateurs, however, in addition to volunteering their services, have offered to provide themselves with telescopes and other equipment. Most of the early teams were organized on this basis, but as the number of stations is increased the problem of equipment becomes serious.

Throughout the United States, observing groups have found that private business or public service organizations are willing to help. Radio stations, newspapers, insurance companies, automobile agencies, and municipal governments have agreed to defray the relatively small cost of setting up a station so local volunteers could participate in the nationwide program.

In Phoenix, Arizona, Carl Bimson, president of the Valley National Bank, has announced that his institution will erect and outfit a complete satellite observing station on the roof of its skyscraper office building. This will include space for storing equipment between observing sessions, and even facilities for serving hot beverages to the observers.

The Evansville, Indiana, Junior Chamber of Commerce is covering the cost of setting up and equipping a station on the roof of the science building at Evansville College. This volunteer team will be under the joint direction of the astronomy department of the Evansville Museum of Arts and Sciences and of the physics and astronomy department of Evansville College.

In St. Louis, H. C. Grigg, president of the Seven-Up Company, has offered to install a station on the flat roof of the downtown office building that is national headquarters for his firm. Plans include a windbreak for the comfort of winter observers. Volunteers at Walnut Creek, California, found sponsorship from the local pipefitters' union. Members of the Mather Air Force Base chapter of the Institute of Navigation announced that they would support a large team of trained observers. They hope their example will stimulate similar participation at other Air Force bases.

Members of the Ground Observers Corps in many parts of the country have requested information on volunteering their services. Col. Broun H. Mayall, director of civil defense at the headquarters of Continental Air Defense Command, Colorado Springs, has stated that official permission for the Ground Observers Corps to co-operate in the MOONWATCH program has been given by the Secretary of the Air Force.

D. Station Registration. At this time, a pressing responsibility of each group leader is the immediate registration of the firm intention to proceed with the operation of a satellite observing station. *This registration must be in the form of an official letter addressed to the coordinator, giving the following data:* (1) Name, address, and telephone number of the leader, his assistants, and all approved observers. (2) Description of the observing site, with its longitude and latitude to the nearest minute of arc, or closer if possible. (3) The sponsorship, if any, of the group. (4) The availability of communications. (5) Description of the timing equipment to be used. (6) A general report on weather conditions at the station, with special reference to sky transparency at morning and evening twilight. This last information can be obtained from the local weather bureau or from personal observations.

Receipt of this letter from a leader will be regarded as the formal registration of his station. Groups will be notified of their acceptance by the coordinator. Immediately, each individual observer will be placed on the mailing list of this bulletin.

E. Correspondence. As explained in *Bulletin* No. 1, it is only by participation in an organized group that the individual observer can contribute significantly to the MOONWATCH program. From now on, therefore, all contacts with the Smithsonian Astrophysical Observatory will be directly between the coordinator and the members of registered observing teams.

Beginning now, all communications should be addressed directly to the Coordinator of Visual Satellite Observations, Smithsonian Astrophysical Observatory, 60 Garden St., Cambridge 38, Mass., and NOT to members of the national advisory committee, a change from previous procedure. Members of the advisory committee will continue to help in development of observational operations, in screening and evaluating observing groups, but they are no longer asked to act as clerical assistants in mailing bulletins or answering general inquiries. Special problems that arise will be referred to committee members for personal handling or advice.

VII. Design of a MOONWATCH Telescope

In *Bulletin* No. 2, Section III, it was recommended that a MOONWATCH telescope have an objective diameter of 45 to 55 millimeters, a magnifying power of 6x to 7x, and a field of view of 10 to 12 degrees. The systematic tests at Silver Spring (mentioned in Section VI) show that size of field and light-gathering power are the main criteria; magnifying power is relatively unimportant.

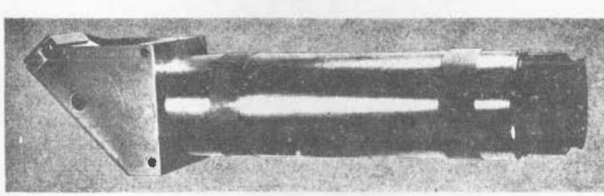
The telescope described here provides a 12½-degree field with impressive image brightness, and has a magnification of 5.5x. The parts cost less than $20 and can be put together easily by a skilled amateur. There is a small amount of spherical aberration at the edge of the field, but this is of little consequence. The exit pupil is slightly larger than necessary, but using a longer-focus objective would lessen the field of view. We feel that this monocular represents the best performance consistent with availability and low cost. All optical parts are war-surplus items that should be readily obtained from supply houses.

The specifications given below are not rigid, but if they are followed as closely as possible standardization of satellite observing methods will be facilitated.

The eyepiece chosen is a wide-angle Erfle of 1¼-inch focal length, advertised as having a field of 68 degrees. It contains a threaded focusing mount, making it easy to adapt it to the aluminum tube. The objective is 51 millimeters in diameter, with a focal length of 180 millimeters, or slightly more than seven inches. It is inserted into a metal cell with an outside thread of 40 turns per inch.

Objective and eyepiece are mounted in an aluminum tube 8½ inches long, whose outside and inside diameters are 2⅜ and 2$\frac{1}{32}$ inches, respectively. In buying such a tube, ask for aluminum pipe, rather than aluminum tubing. It is strong enough to stand chucking in a lathe when the inside wall is threaded to take the objective and eyepiece. The objective end of the tube should be threaded far enough so the metal cell can reach about ¼ inch inside the tube. Thus, the back surface of the objective is approximately 7⅛ inches from the front surface of the eyepiece. This arrangement provides a focusing range from about 10 feet to infinity. The details of the assembly are seen in the diagram on the next page.

As shown in the photograph, a front-surface aluminized or silvered mirror is mounted at a 45-degree angle in front of the objective. Its purpose is

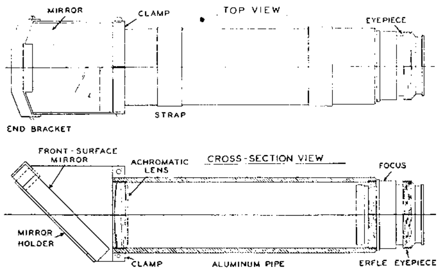


The MOONWATCH telescope is very simple to construct and to use. Compare this view of a sample instrument with the diagram of the optics and parts on the next page of this bulletin.

to allow the observer to watch his sky area in comfort, irrespective of its altitude above the horizon. The mirror need not be of highest optical quality, but it should not introduce undue light loss or distortion. It must be large enough to fill the entire area of the objective. Whatever form of mounting is selected, it is important that the horizontal axis of rotation of the telescope (for change of altitude) lie as close as possible to the center of the 45-degree mirror.

Entirely apart from its use as a MOONWATCH instrument, this monocular is excellent as a small rich-field telescope, and installation of a reticle in the focal plane converts it into a very effective finder.

R. H. DELLAR



The details of the MOONWATCH telescope.

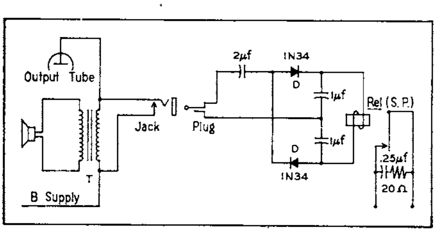
VIII. A Chronograph for Timing Satellite Observations

EDITOR'S NOTE: The article below describes an excellent satellite timing procedure, but relatively expensive timing and recording devices are *not* necessary to do adequate MOONWATCH timing. Teams can do well by using stop watches or simply by having one person call off successive seconds as received by radio. Each observer then mentally estimates satellite passage to a fraction of a second.

One of the most exacting requirements of the MOONWATCH program is accurate timing. The following procedure can allow a precision of 1/10 second in visual observations of an artificial satellite. The time record is made on paper, using a pen-and-ink recording chronograph.

I employed a recording seismograph drum, an instrument which has a pen travel of 60 millimeters per minute. The construction of a simple chronograph is described in *Amateur Telescope Making—Advanced,* page 460. Instead, one could use a Sanborn hot stylus, a Brush oscillograph, a Sprengnether ink recorder VR40-0 or VR40T, or a recording voltmeter or milliammeter. Any one of these recorders draws a time line in which uniformly spaced reference marks can be inserted.

These marks may be provided by a chronometer with contacts that close once a minute, by any good pendulum clock, or by a Sangamo Electric Co. BC-608A surplus contactor unit. This unit costs about $1.50, and can be adjusted to a rate of within two seconds gain or loss per day.



Matched diodes (Sylvania 1N35) give best results in this chronograph trigger circuit. The relay (Potter and Brumfield PW-5LS) has a coil impedance of 5,000 ohms; any similar plate relay will serve.

Time indicated by the clock is then checked periodically against accurate short-wave radio time signals broadcast by WWV in the United States or WWVH in Hawaii. For information about these time signals, see *Sky and Telescope,* October, 1956, page 542, or write Radio Standards Division, National Bureau of Standards, Boulder, Colo. The most satisfactory method of comparing radio and clock time is to register the radio time signal directly on the chronograph record; this allows measurement of the clock correction with at least as much accuracy as attained in timing the observations. To do this, a relay must be closed to deflect the recorder pen in response to the make and break of the radio signal.

The diagram shows a rather simple and inexpensive solution of this problem. The audio-frequency voltage across the speaker transformer primary *T* of the radio receiver is rectified in a voltage-doubling circuit containing the two diodes *D*. The output of this system is applied to the coil of a plate-circuit relay *Rel.* With the circuit components listed, the relay closes on about 10 volts. A good time record is given when this relay closes in parallel with the clock contacts, which are connected to a battery or suitable d.c. power supply to deflect the recording pen.

If each observer has a microswitch in parallel with the clock and radio relay, he can deflect the pen to record his time of observation. Afterwards, the time of observation is obtained by measuring the paper record and applying the clock correction.

Many refinements could be added to this basic system. For example, the observer who makes the record can be identified by placing a resistor in series with each microswitch, so there is a predetermined amount of pen deflection from each observing post. It is possible to have observers viewing the northern sky make upward deflections on the record, and downward deflections for observers facing south, by reversing polarity.

WALTER G. MARION
University of California

The Strolling Astronomer

SUBSCRIPTION RATES

1 Issue (in stock) - - -	$0.35
Double Issue (in stock) - - -	0.70
6 Months - - - - - -	1.75
1 Year - - - - - - -	3.00
2 Years - - - - - -	5.00

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.

STAFF

LUNAR RECORDERS

Walter H. Haas
1203 N. Alameda Blvd.
Las Cruces, New Mexico

James Q. Gant
The Montana
1726 M St., N. W.
Washington 6, D. C.

Alika K. Herring
3273 Liberty Blvd.
South Gate, California

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.

STAFF

EDITOR

Walter H. Haas
1203 N. Alameda Blvd.
Las Cruces, New Mexico

SECRETARY

Atty. David P. Barcroft
1203 N. Alameda Blvd.
Las Cruces, New Mexico

COUNSELLOR

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

MERCURY RECORDER

Owen C. Ranck
P. O. Box 161
Milton, Penna.

VENUS RECORDER

Dr. James C. Bartlett, Jr.
300 N. Eutaw Street
Baltimore 1, Maryland

MARS RECORDER

Frank R. Vaughn, Jr.
5801 Hammersley Road
Madison, Wisconsin

JUPITER RECORDER

Henry P. Squyres
3608 N. Durfee
El Monte, California

SATURN RECORDER

Thomas A. Cragg
246 W. Beach Avenue
Inglewood 3, California

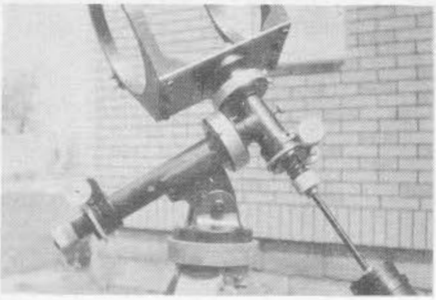
URANUS-NEPTUNE RECORDER

Leonard B. Abbey, Jr.
822 S. McDonough St.
Decatur, Georgia

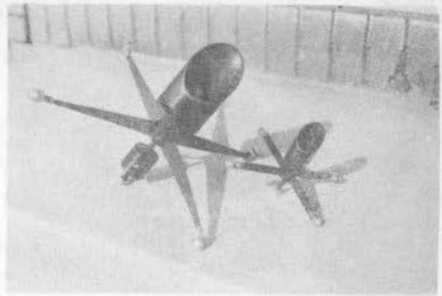
LUNAR METEOR SEARCH RECORDER

Robert M. Adams,
324 S. Valley,
Neosho, Missouri.

QUALITY OPTICS (HAROLD E. SNYDER) WALBRIDGE, OHIO



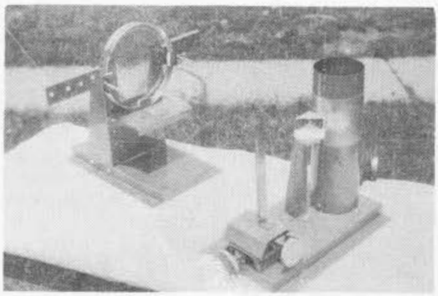
Equatorial Mounts
6″ $100.00 $ 80.00 (without circles)
8″ $145.00 $125.00 (without circles)
Hard Maple Tripods $25.00



Spiders (secondary supports)
Sizes from 1″ to 3″
Prices from $12.00 to $30.00
Prism type also available.

ALSO

Parabolic Mirrors
Elliptical Flats
8X Elbow Finders
Oculars
Focusers
Kits
Books
Sun Filters
Star Diagonals
Mirror Cells



Foucault Tester and Rack
Adjustable for 4¼″ to 12½″. Microaction towards mirror.
Only $24.95 Postpaid
1¼″ ¼ wave perfect prism included

FEATURING

Ready-made Pitch Squares—Beeswax Coated. Takes all the mess out of lap making. Perfect lap everytime.

Size 1″ x 1″ x ¼″.

Only $1.25 per dozen postpaid.

When answering this ad please mention **The Strolling Astronomer**

Equatorial Mounts
6″ $100.00 $ 80.00 (without circles)
8″ $145.00 $125.00 (without circles)
Hard Maple Tripods $30.00

WANTED

Large Pyrex Blank or Mirror. Size 24″-40″.
State Condition and Price.

ALAN McCLURE

649 South Olive Street — Rm. 819
Los Angeles 14, California

Amateur Astronomers Handbook, by J. B. Sidgwick $12.50
Observational Astronomy for Amateurs, by J. B. Sidgwick $10.00
The Moon, by Wilkins and Moore $12.50
Guide to the Planets, by Moore $ 4.95
Guide to the Moon, by Moore $ 4.95
Norton's Star-Atlas $ 5.25
Elger's Map of the Moon $ 1.75
Exploring Mars, by Richardson $ 4.00
Physics of the Planet Mars, by deVaucouleurs $10.00
NEW: Guide to Mars, by Moore $ 2.50
NEW: The Earth-Satellite, by Moore $ 2.95

All available publications. Write for new enlarged list. Out of print books located.

HERBERT A. LUFT
42-10 82nd Street
Elmhurst 73, N.Y.