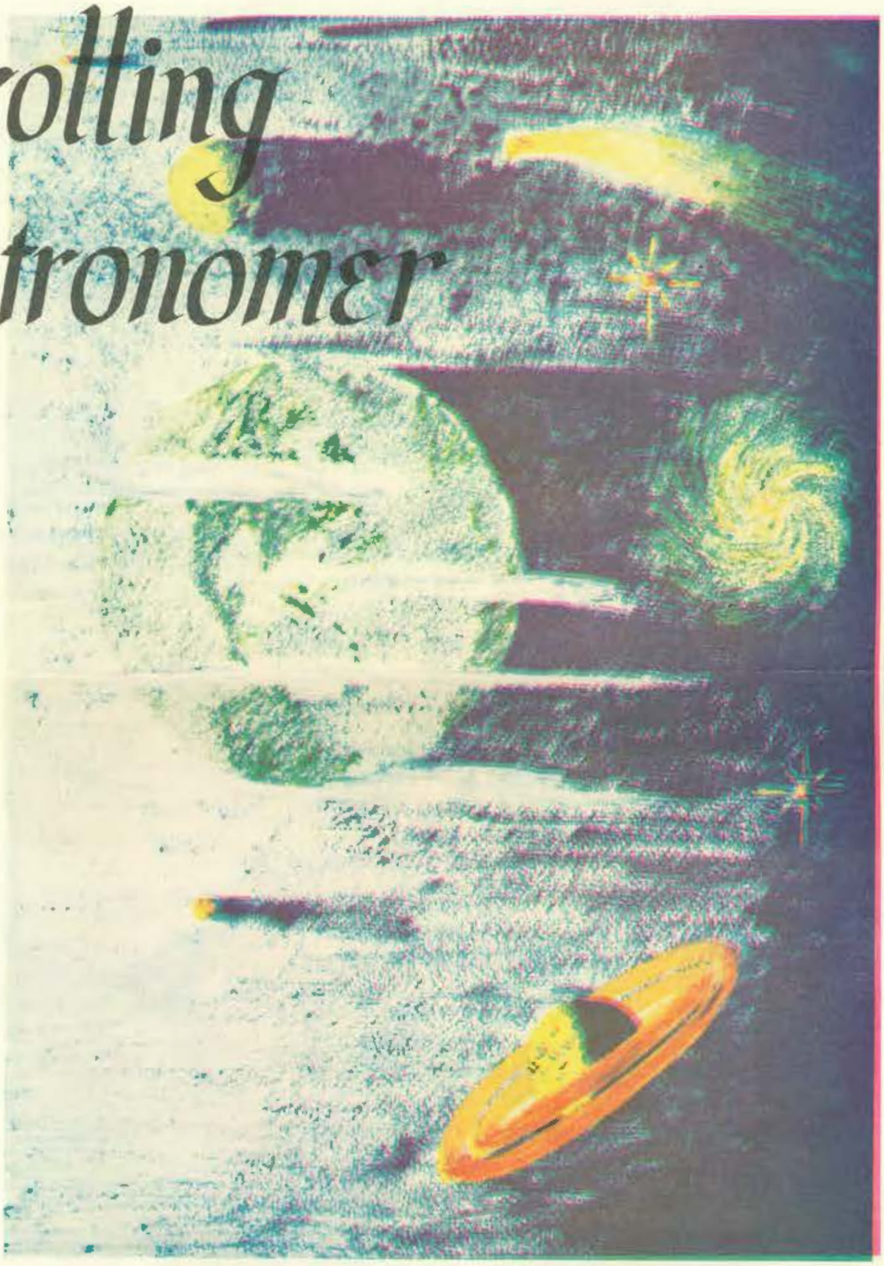
Volume 6, Number 12 December 1, 1952

The Strolling Astronomer

ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS



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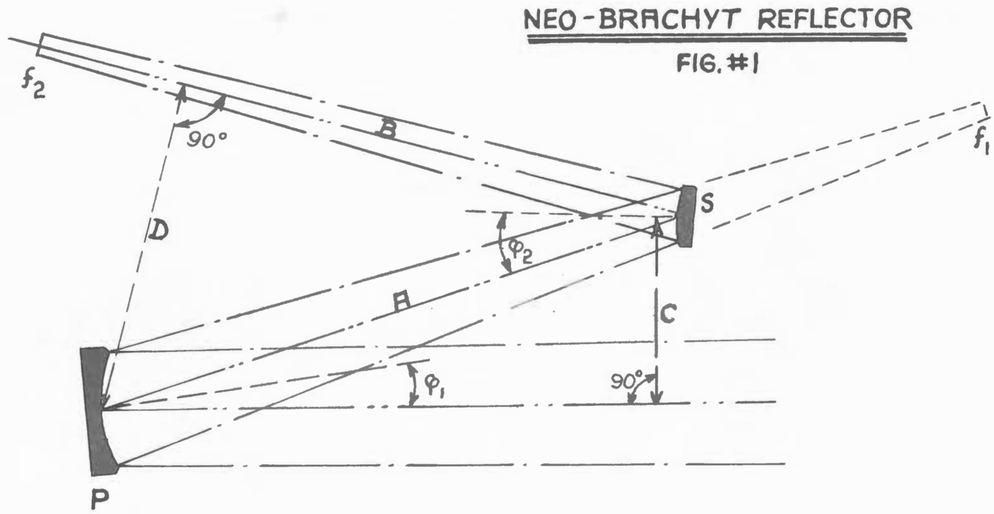
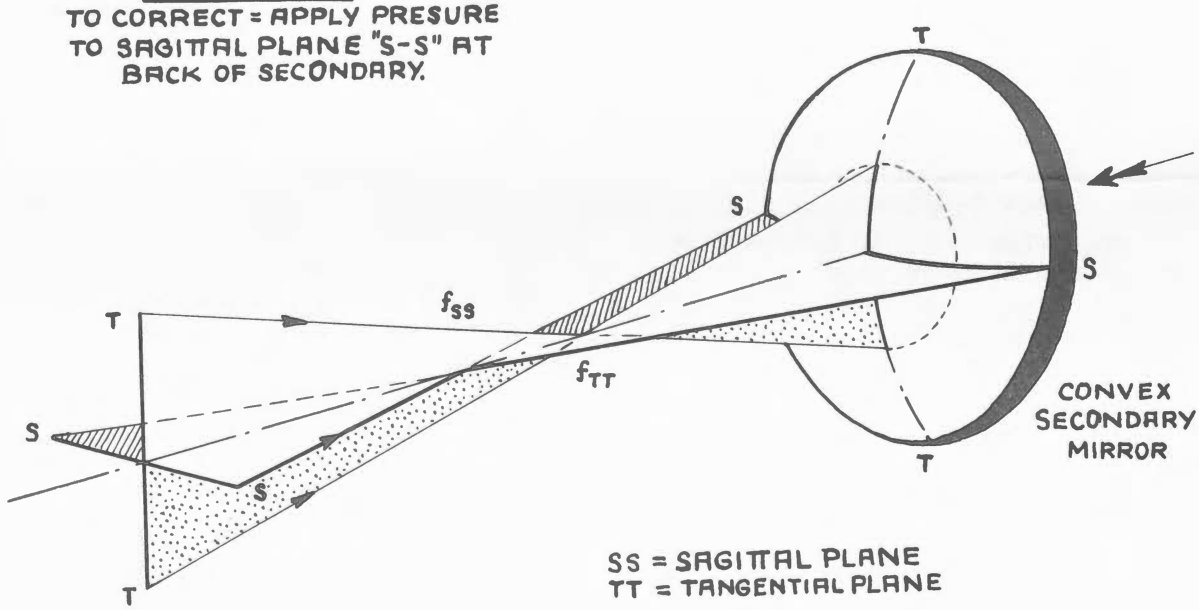


FIG. № 2
ASTIGMATISM:
TO CORRECT = APPLY PRESURE
TO SAGITTAL PLANE "S-S" AT
BACK OF SECONDARY.



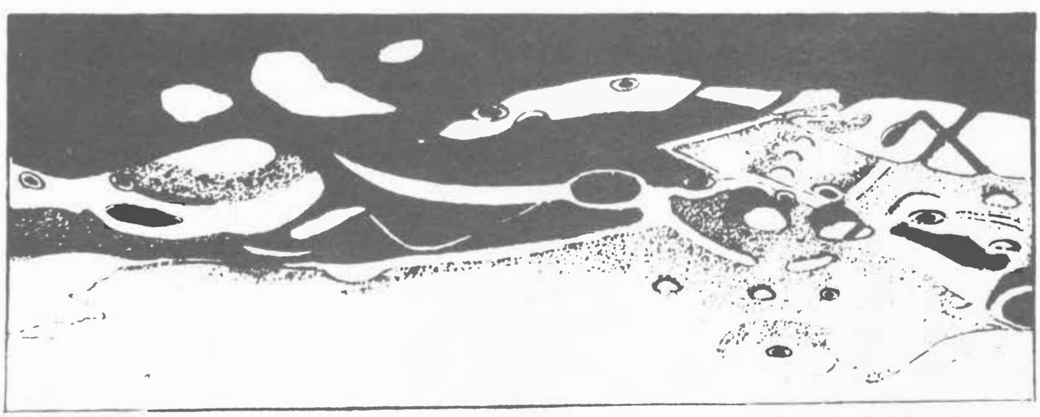


Figure 3. (Left). Grimaldi East Inner Wall. K. W. Abineri. 8-inch refl. 232X. Feb. 19, 1951. $22^h\ 15^m$, U.T. Colong. = 71°2
Note: East at top and South at left.

Corrections to November, 1952 Issue. Pg. 157, line 16. Murayama's instrument was an 8-inch refractor. Pg. 161, next line to bottom. The accepted rotation period of Uranus is 10 hrs., 45 mins. Pg. 162, line 17. Read "a mile or two."

New Amateur Society. It gives us great pleasure to announce the formation of another Western Amateur astronomical society, this time in San Francisco, California. The newcomer has chosen the name of San Francisco Amateur Astronomers. Meetings are being held in the Josephine D. Randall Junior Museum of the Recreation and Park Department of San Francisco. Information may be had from Mr. H. A. Wallace, the President, 2925 A Jackson St., San Francisco 15, Calif.

Reproduction of Drawings. As our notice regularly carried on the front inside cover should tell our friends and contributors, drawings cannot be reproduced in a satisfactory fashion in this periodical if the markings on them are too faint. Nevertheless, we continue to receive some drawings which it is useless to try to reproduce; and on certain others which are reproduced some detail is inevitably lost. Therefore, exaggerate contrasts on drawings submitted to Section Recorders or to the Editor. Make the edge of the planet distinct. If in doubt, strengthen a feature on your drawing to facilitate its clear reproduction. The Stevens Agency of Albuquerque, New Mexico has been doing an excellent job with illustrations in The Strolling Astronomer. Let us help them by supplying good original copy.

Late Mailing of Recent Issues. The Editor regrets very much that recent issues have not been ready for mailing until several weeks after the ostensible date of publication. The chief reasons are his own lack of time, after rather long hours at regular work, and imperfect health. Every effort will be made to remedy this situation.

Foreword. G. D. Roth and E. L. Pfannenschmidt, the authors of the following article about a type of reflecting telescope which has become popular in Central Europe in recent years, are already known to our older readers. Mr. Roth is the leader of the Moon and Saturn Sections of the Planetensektion der Sternfreunde (loosely: German Planetary Section) and is also their Foreign Correspondent for regions outside of Continental Europe. His address is Lengmoostr. 6, Munich 9, Germany. For some years a leader of German amateur planetary observers, Mr. Pfannenschmidt now is a member of the Montreal Centre of the Royal Astronomical Society of Canada. His present address is 375 Waverly St., Port Arthur, Ontario, Canada.

In a letter dated December 16, 1952, Mr. Roth announces the good news that Mr. Kutter has completed a book about the Neo-Brachyt off-axis reflector, a book expected to be published no later than the spring of 1953. In addition Professor Staus of the Munich-Pullach Private Observatory has written a book in German about the building of mountings and amateur observatories. The price of this book, described by Roth as "a very worthy guide to all working amateurs", is D. M. 8.50, postpaid. Mr. Roth expresses his desire to help interested colleagues outside of Germany to obtain both books, possibly through some exchange of literature.

THE NEO-BRACHYT OFF AXIS REFLECTOR

by G. D. Roth and E. L. Pfannenschmidt

In recent years German and other Central European amateurs have been employing a new type of reflecting telescope in their planetary, solar, and lunar work which they have termed the "Neo-Brachyt" but more frequently refer to as the

"Schiefspiegler" or "oblique reflector". This type of telescope is a modification of the Brachyt Telescope, invented by I. Forster and K. Fritsch of Vienna in 1876. Since American colleagues have repeatedly asked for detailed information on this interesting and versatile type of reflecting telescope, the authors have undertaken to submit for the benefit of American friends the present article.

The Neo-Brachyt, or Neo-Bra as we shall call it, is an off axis reflector employing a concave primary and a convex secondary of strictly spherical figure. In principle, therefore, it is actually an off axis Cassegrainian, Figure 1 on pg. 167. The beautiful simplicity of its construction is to be found in its spherical optics. Anyone acquainted with the difficulties usually experienced in producing a highly accurate paraboloid will no doubt greatly appreciate the following data on a precision instrument eliminating the use of aspherical optical components and yet offering the advantages of a compound reflector. If properly constructed and collimated, the Neo-Bra will perform as well as a Newtonian of similar aperture. As the former Director of the Planetensektion, Pfannenschmidt has had ample opportunity not only of observing with various Neo-Bras but also of comparing their visual and photographic definition with that of Newtonians and compound reflectors. They compete remarkably well with the more conventional types.

We may summarize the Neo-Bra's advantages as follows:

1. Spherical optics, hence simple construction.

2. Long focal ratio, F:18 to F:20, hence improved definition, high magnifications with long e.f.l. eyepieces allowing good eye-relief, etc.

3. No central obstruction of the primary by the secondary, hence reduced diffraction. [Experiments with unobstructed, reduced-aperture reflecting systems by Clyde W. Tombaugh suggest that it is most desirable to eliminate the diffraction caused by the secondary and its supports in the conventional reflector.--Editor.]

4. Compound construction, permitting a light and stable mounting and a short tube.

Let us now consider the instrument's design and the various methods of eliminating aberration. Since we shall have to incline the primary to eliminate central obstruction, we shall select as the primary's figure a sphere, which is less sensitive to oblique incident rays than any aspherical imaging surface. The two major aberrations arising from this inclination are astigmatism and coma, their values increasing with the angle of inclination. To reduce--at the very outset--such inherent aberrations to a minimum,we shall choose the smallest permissible angle of incidence, combined with a practical focal ratio. "Standard" German Neo-Bras of from two to eight inches in aperture have an F:12 spherical primary inclined approximately 3°15' of arc to the incoming light rays. Incidentally, these primaries are often made of coated spectacle lenses and are well suited for junior telescope making classes, physics classes, etc. Simple optical calculations will prove that mirrors of the given dimensions have negligible paraxial aberrations, coma, etc.

The convex spherical secondary, having the same radius of curvature as the primary, is separated from the latter by a distance equal to seven diameters of the primary, its inclination to the primary's new (deflected) axis being a very nearly $12^{\circ}56'$ of arc. <u>Thus the Neo-Bra's overall length amounts to but 40% of the equivalent focal length.</u> The secondary's diameter is precisely half the primary's.

Neo-Bras up to four inches in aperture may be successfully designed from the data above. However, if larger apertures are desired, it will be necessary to give more precise figures and also to devise new methods of eliminating the effects of coma and astigmatism. Such has been admirably well accomplished by advanced German A. T. M's., foremost among them being Mr. A. Kutter and Professor Staus. Therefore, we shall discuss briefly and without mathematics the most practical method devised and shall close with precise data for constructing an 8-inch Neo-Bra.

Well, here's the story. In the course of their studies Kutter and Staus--like other before them--had found that it is quite possible to correct an optical system of the type described to well within the Rayleigh Limit for either astigmatism or coma by merely inclining the two spherical mirrors at a certain angle. It is impossible, however, to correct both aberrations simultaneously by the same method because astigmatism and coma are governed by different optical mathematical laws. Kutter's first achievements were thus small Brachyts up to four inches in aperture, corresponding almost exactly to the data given above. They were corrected for astigmatism by a proper tilt of the optics, their small aperture and long focal ratio reducing coma to approximately three seconds of arc. This residual aberration was finally eliminated by having the secondary minutely obstruct the primary, the latter's area thus shadowed amounting to only 3% of its total area. Roth possesses such an instrument. It performs beautifully and on good nights permits the use of maximum power, i.e., 50X per inch of aperture.

Kutter and Staus, it seems, went yet a step further in examining the effects of primary obstruction, pushing the useful aperture to five and even six inches. However, this small gain in aperture, won at the price of inducing asymmetrical diffraction effects, did not by any means appear to be the ideal solution of the Brachyt problem. Your authors have tried in vain to establish who actually found the final solution; for curious as it may seem, nothing has yet been published on the Neo-Bra. It probably occurred to a number of A. T. M's. simultaneously to design--along the general lines mentioned above--a Brachyt system free of coma and then to eliminate astigmatism by mechanically deforming the thin spherical secondary to slight cylindricity along its sagittal axis, Figure 2 on pg. 167. In practice there is manually operated a small push screw at the back and center of the secondary's cell, this screw in turn pressing a metal bar diametrically against the mounted mirror in a position corresponding to the mirror's sagittal axis. Here, then, is the "secret" of the Neo-Brachyt reflector. In the Neo-Bra, final image perfection is not accomplished by laboriously figuring the optics to aspheric, asymmetrical surfaces but simply by collimating and adjusting the system properly and then slightly deforming one element by means of a mechanical operation.

The final effect invites no cause for cirticism; an 8-inch Neo-Bra will show perfectly round, concentric star images at powers of 300 to 450, its field corresponding to approximately 30 minutes of arc.

Neo-Bras more than eight inches in aperture will require the designer to select a shorter focal ratio. Troubles may arise, and it would be wise to do some trigonometrical ray tracing. Usually, undercorrecting the primary to Dall-Kirchem requirements will have an improving effect. Thus Professor Staus owns a 12-inch Neo-Bra with an undercorrected primary (50-55%). With the duly deformed spherical secondary it produces excellent star images at a power of 500.

Mr. Robert Venor of the Montreal Centre of the R. A. S. C. is currently construction a 6-inch Neo-Brachyt to your author's specifications, probably the first of its kind to be made in North America. We shall be glad to give you any information you may desire about such topics as design, tolerances, shop procedure, mountings, adjustment, collimation, etc. Drop us a line, will you?

Data for an 8-inch, F:20 Neo-Bra (refer to figure 1 on pg. 167):

Primary P. $A = 200$ mm. $f=2400$ mm. $F=12$. $R_1=4800$ mm.

Secondary S. $A=100$ mm. $f= -2400$ mm $F=24$. $R_2= -4800$ mm.

Angles. $\phi_1 = 3^\circ 16' 30''$. $\phi_2 = 12^\circ 54'$.

Distances. $A=1440$ mm. $B=1600$ mm. $C=165$mm. $D=627$mm.

Miscellaneous. Size of 30' field at $F_2 = 35$ mm.

Coma-Correction $\Delta 4 \times \phi_1$ and $\phi_2 \cong 12\frac{1}{4}''$

Figure 1 on pg. 177 is a snapshot of H. Oberndorfer's 120-mm. Neo-Brachyt reflector.

THE BRIGHT RAYS ON THE MOON

by Guenter D. Roth
Acting Lunar Director of the Planetsektion der Sternfreunde

A very interesting and curious phenomenon on the surface of the Moon is the systems of bright rays, which we can see around many craters. It is a widespread opinion that these brilliant rays are only visible at full moon. Indeed, they are most prominent at that time. Nevertheless, many observations, for example by P. Ahnert at the Sonneberg Observatory, have shown that the rays are visible within ten degrees or less of the terminator, the amount being different in different lunar regions. During April, 1951, P. Ahnert made some observations with the following results:

April 11, 19^h, U. T., terminator 29°W. The rays of W. H. Pickering between 47°W. and 42°W. were clearly visible, as was also the northeast ray of Proclus.

April 15, $20^h 15^m$, U. T., terminator 20°E. The rays of Copernicus were very easy to observe near the terminator.

April 16, $19^h 25^m$, U. T., terminator 32°E. The northeast double ray of Tycho was visible where it crossed the southeast corner of Mare Nubium. The west component (Weiss E to Bullialdus B) was situated between longitudes 19°E. and 22°E., the east one (Cichus to Koenig) between longitudes 21°E and 24°E.

These observations and others have also been verified by photographs. In interpreting the rays one must consider this fact and may not claim that the rays are visible at full moon only.

It was the opinion of the well-known observer P. Fauth that the rays are not uniform structures but are a series of crowded light spots and lines. Their arrangement along a longitudinal axis and their concurrence near circular craters may cause an appearance of a system of rays to the eye. It is also the interpretation of P. Ahnert that, strictly speaking, the greater part of them are not rays. Rather they look like irregular brush-strokes laid on a darker background in their main direction. And perhaps there is no exact connection. Usually the converging point of the rays is the center of the crater, but we can also find examples where their direction is tangent to the rim of the crater.

There are two principal types of ray-systems:

1. The Tycho-type rays. Here the individual ray is widest where it leaves the crater and usually, but not always, is pointed and much thinner at its terminal end distant from the crater.

2. The Copernicus-type rays. These rays are for the most part very irregular and crooked. They give the impression of a web or network.

However, we can find rays which do not originate in or near a crater but instead start at some distance. A good example is the crater Tycho, which is surrounded by a bordering dark corona from which rays start at a distance of about 60 kms. The average length of the rays is different too; e. g., the rays of Tycho average 1800 kms., those of Furnerius 1200 kms., of Thales 800 kms. of Copernicus 600 kms., of Kepler 300 kms., and of W. H. Pickering 200 kms.

Some detailed studies have been made about the course of the rays and about possible irregularities. According to K. Graff there is no sign of a shadow along their course so that the rays can be neither higher nor lower than the surrounding surface. Rather they must be plane places which reflect light better than their surroundings, especially with high lighting. This interpretation is based, in the writer's opinion, too much on the supposition that the rays are visible at full moon only. Moreover, studies with the Mount Wilson 100-inch reflector have revealed a little shadow when the solar lighting is low enough.

A Summary of the lengthy observations, especially upon the system of Tycho, by F. Billerbeck-Gentz gives these results about the course of the rays:

1. The course is not always exactly rectilinear.

2. Some rays are suddenly interrupted before crossing a crater and then reappear with notable intensity a little beyond the crater (e. g., Polybius A, Fracastorius E, Rosse). This aspect often gives the impression that the crater is followed by a comet-tail. There is also the impression of some connection between the crater and the sudden increase in the intensity of the ray.

3. Very often the course of rays is over terrain where, under very low lighting, one can record rather long swells of the lunar surface (e. g., Bullialdus and south of Janssen).

4. Often a number of small objects, light spots or craterlets, create the impression of a ray because of their grouping.

One of the systems studied in most detail is that of Tycho. Apart from small rays, one can record 10 principal rays. These main rays and their courses are as follows:

Ray Number I. Start: south of Heinsius. Course: Cichus, Kies, Koenig. End: Lubinieski E and Riphaen Mtns.

Ray No. II. Start: east of Sasserides A. Course: Wurzelbauer, east of Hesiodus-Bullialdus B, Bullialdus, Lubinieski. End: Riphaen Mtns. Rays I and II form a great double ray brightest near Bullialdus.

No. III. Start: west of Sasserides. Course: Regiomontanus, Purbach, Thebit, Ptolemy. End: north of Spoerer (the course through Sinus Medii is uncertain). Some observers, such as H.J. Klein, have thought the course to be through Menelaus and Bessel to Lacus Somniorum. However, this opinion may be due to an optical error because a superficial view with a low mangification shows that the ray through Menelaus and Bessel appears to have the same direction as Tycho III.

IV. Start: Lexell. Course: west of Regiomontanus, Parrot, Albategnius, Hipparchus. End: west of Sinus Medii.

V. Start: North of Orontius. Course: Walter, Abulfeda, End: Descartes.

VI. Start: south of Orontius. Course: Stoefler, Gemma Frisius, Altai Mtns., Fracastorius E. End: Mare Nectaris. This very interesting ray is a good example of the first and second points in the summary given above of the observations by F. Billerbeck-Gentz.

VII. Start: southwest of Tycho near Saussure. Course: Maurolycus, where it developes branches VIIa and VIIb. End: VII near Stevinus, VIIa near Metius, and VIIb between Metius and Fabricius.

VIII. Start: Maginus. Course: Clavius-west, Gruemberger. End: south pole.

IX. Start: Longomontanus-west. Course: Clavius-east, wilson. End: Doerfel Mtns. Rays VIII and IX have perhaps the same origin southwest of Tycho and are divided in their subsequent course.

X. Start: between Tycho and Longomontanus. Course: Longomontanus, east of Scheiner. End: west of Bailly. Ray X is very bright.

It would be a worthy plan if observers would use this order for future systematic studies in order to have a common base. According to a proposal by F. Billerbeck-Gentz, all other rays of Tycho should be listed with a letter of the Greek alphabet and attached to one of the 10 main rays. Moreover, plus or minus signs may be used for a position west or east, respectively, of a main ray. For example VII /Alpha/ + would mean the first associated ray of VII, lying to the west of VII.

Exact studies of the ray-systems lasting for many years are to date very rare. Nevertheless, they constitute a worthy project for every observing amateur who is willing to do serious work. There are not many prerequisites for such a study, but perserverance and objectivity are absolutely necessary. The optical equipment should be at least a 2-inch telescope, F:12 to 20. Even this small aperture may be enough for successful work. A neutral filter to reduce the brightness of the moon may be useful. In connection with visual observations it may also be worthwhile to use color filters of known transmission at different wave-lengths. Photographical studies will need to be supplemented by Visual ones because overexposures and underexposures on photographs are a handicap for detailed work. It is necessary for all observers to have a map of the moon, at least an outline map. It is very helpful if the map is both detailed and easy to handle. For exact studies a good solution is to use the very handy reproduction of H. P. Wilkins' map of the Moon as published in The Strolling Astronomer (The Journal of the A.L.P.O., U.S.A.)

The observations should follow an exact program, and the writer proposes the following:

1. Record the start, course, and end of each ray.

2. Record the width and the brightness (intensity)of each ray.

3. Determine whether there is a variation in every ray's intensity along either its width or its length. If there is, record the position and the time [thus the solar lighting.]

4. Determine the general condition of the lunar surface along the course of the ray. Perhaps bright spots and craterlets or swells in the terrain simulate a ray.

5. Record the form of the ray. Is it absolutely rectilinear? Where does it have branches or interruptions? Position, etc.

6. Watch for any detail within the ray showing different colors of the lunar surface, at a time when the ray itself is invisble.

7. Record the appearance and disappearance of the rays in different lunations.

8. Use color filters in the different observations, and record any change of appearance in different colors.

9. In connection with observations 1-7, studies of the polarization of the reflected light may be very worthwhile.

10. If possible, compare selenographical observations with similar geological phenomena.

These ten articles may be a clue for observers. Surely experience will give individual methods too. However, it is desirable to have an international standard program for cooperation and recording data. The Lunar Department of the Planetensektion der Sternfreunde (German Planetary Section), directed by Mr. W. Loebering and the writer, proposes a world-wide cooperation in this special research, especially with the Lunar Section of the British Astronomical Association and with the Association of Lunar and Planetary Observers in the U.S.A

The writer will finally offer some remarks about the theoretical interpretation of the bright rays.

It was the view of Carpenter and Nasmyth that the rays were caused by explosions of the solid surface of the Moon, as a glass ball may be exploded by interior pressure. Other interpretations were made by Maedler and Franz. The former had the opinion that there is a change in the structure of the lunar surface where the rays lie, but Maedler had no explanation for his supposition. According to Franz a crystalline fluid erupted and condensed around the craters and is now visible by reflected light as rays. This view takes care of the fact that the rays often cross without deviation very rugged terrain.

Some interpretations are occupied with the possibility of volcanic dust or ash as the cause of the rays. F. V. Wolff in 1914 concluded that the rays are composed of volcanic ash from explosions and that the coarser dark material near explosion centers is composed of bombs and lapilli, as for example at the great crater Tycho. F. E. Wright wrote (Carnegie Institution of Washington Publications, No. 501, 1938): "It was suggested many years ago by different observers that the rays from a crater are streaks of fine dust or ashes blown out from its top or side, and carried along by the jets of hot escaping gases, from which they settled out along the paths followed by the streaming gases. This explanation of the origin of the rays seems to accord well with the observed facts." In his book Geology Applied to Selenology J. E. Spurr mentioned that there is no reason to doubt that the rays represent finely divided or dusty material blown from the crater--volcanic dust or ash, and the gusts which blew them away from the crater was of volcanic gases impelled by the explosions which comminuted the lava into powder. During 1943 Dr. R. A. Spurr made some experimental reproductions of rays, investigating, in the pattern of dust or powder distribution by explosions, the difference, if any, between explosions in air, as on the earth, and in a vacuum, as on the Moon. The very interesting photographs of the experiment in vacuo indeed give the impression of a crater with rays, similar to Copernicus.

Some years ago R. Schwinner (Astronomische Nachrichten, Bd. 274, Nos. 2-3) offered an interesting theory for discussion. It is his opinion that the rays correspond to magmatic activity around some large craters. According to Schwinner the magmatic activity resulted in the radial formation around craters of clefts, filled with "pegmatite". Originally these formed walls, similar to the Straight Wall near Birt and Thebit; but the very great lunar diurnal change in temperature (200-300 degrees) wore down the walls, the rocks breaking off and forming wide sand and metal ridges. The brightness results from the high reflecting power of the mica in the "pegmatite."

In the opinion of the author these interpretations do not distinguish between the types of rays, especially between the Tycho and Copernicus types. Yet even a superficial study of the rays gives the impression that there is a difference, hence presumably a different origin. It may be apparent that Tycho and its rays are an exception. To what extent there is the possibility of a contact-metamorphosis, for which Tycho could have been the stimulator, is yet obscure. At any rate there are connections with geological elements. Another fact is that some bright and white rays are due to a series of very small brilliant craters arranged like rays or lines. For example, Mare Humorum and parts of Mare Serenitatis are covered with hundreds of small bright craters. [A.P. Lenham has written that many of the multitude of small craterlets shown in his map of Mare Humorum on pg. 181 are visible as tiny bright spots under high solar illumination.] Also, a series of craters north of Stadius lies directly along a bright ray of Copernicus.

The present knowledge of the Moon's rays is by no means definitive. A solution of the problem is not possible by theories alone but must chiefly require exact practical observations, based on a comparison of geological and selenological studies.

Postscript by Editor. Mr. Roth has honored our Association of Lunar and Planetary Observers with an invitation to participate in what can become an important, international cooperative study. We can only accept with thanks.

It is evident that a study of this kind will be most effective if planned very carefully. Hence, correspondence on the subject from members will be welcome. Conceivably we may eventually want to set up a Lunar Bright Rays Section similar to the Sections we already have on the different bright planets. It may be desirable to make a standard form for recording observations of the rays, similar to the forms now used by the A. A. V. S. O. and the A. M. S. in their specialties. As Mr. Roth points out, it is important to try to interpret selenology in terms of geology, as J. E. Spurr has done in his stimulating book. Many ideas will occur to the lunar student in connection with Roth's ten articles in his project. For example, on what scale should lunar intensities be estimated? To what extent may photographs be used in this study? He who tries will soon despair of drawing all the rays on the moon--or even of drawing adequately such a complex and tangled system of rays as the one around Copernicus! May statistical studies be made to determine whether the number of small, bright craters lying along the course of rays is too great to be a random distribution?

But though difficulties exist, let us do <u>something</u>. There are dozens of telescopes now idle in the hands of A. L. P. O. members. Here is a challenging problem about which little enough is known. Let us be up and doing!

BOOK REVIEW

by Walter H. Haas

<u>Insight Into Astronomy.</u> By Leo Mattersdorf. 223 pages. $3.50. Lantern Press, Inc., New York. 1952

This book deserves praise as a good descriptive text for the beginner or the amateur. The author is the President of the Amateur Astronomers Association, Inc., New York City, and is a charter member of that society. The style of writing is easy and conversational and can be readily followed by anyone. A number of personal anecdotes add to reader interest, such as the author's 12-hour delay when he learned that the ferry across an inlet of the Bay of Fundy could only float at high tide!

The book begins with a view of the sky on a clear, starry night, and quick mention of some of its sights. The moon, the sun, the planets, and comets and meteors are then treated in that order. Next, the stars and an invitation to constellation-study follow. A chapter on celestial navigation deserves praise; the author simplifies the problem of circles of position by first assuming a non-rotating earth. Then Mr. Mattersdorf tells us of the Milky Way, other galaxies, and the curious red shift. We come back to earth to learn about precession and eclipses. A chapter on the tides is a good treatment of this not-so-simple subject, and the mysterious high tide on the side of the earth away from the moon is explained by adding the effects of gravitational attraction and the acceleration of the earth as a whole around the center of gravity of the earth-moon system. The book concludes with a discussion of time and the calendar. There is a good list of suggested reading.

One unusual feature is the "phonetid" spelling of astronomical names as an aid to their pronunciation. Examples are Zo-Dyé-Ah-Cal for zodiacal and Ka-Péll-Ah for Capella. There are about a dozen good astronomical photographs in one place near the middle of the book and a number of helpful diagrams, each close to the pertinent text. The book is authoritative and is singularly free of errors. It has a definite place in the ordinary amateur's library.

Figure 1. 120-mm. Neo-Brachyt Off Axis Reflector at Private Observatory of Hans Oberndorfer, Germany.

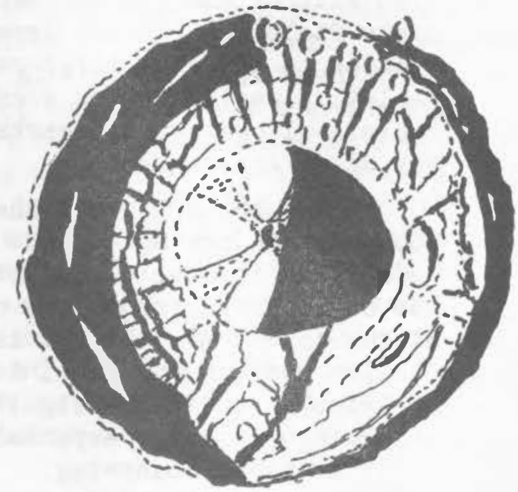


Figure 2. Lunar Crater Alpetragius. H. P. Wilkins. Meudon 33-inch refr. 460X.
April 3, 1952. 22^h, U.T.
Colong. = 16°.7

LUNAR ECLIPSE OF JANUARY 29-30, 1953

The circumstances of this eclipse by Eastern Standard Time are as follows: Moon enters penumbra, Jan. 29, 3:40 P.M.; Moon enters umbra, 4:54 P. M.; Totality begins, 6:05 P. M.; Totality ends, 7:30 P. M.; Moon leaves umbra, 8:40 P. M.; Moon leaves penumbra, 9:54 P. M.

Even on the Atlantic Coast totality will begin in twilight, and the rest of the country will have an even poorer view. Our Association of Lunar and Planetary Observers has been chiefly interested in lunar eclipses for two purposes: watching for possibly lunar meteors and meteoritic impact-flares during totality and searching for possible eclipse-caused changes in certain lunar areas (for example, in Plato, Atlas, Grimaldi, Riccioli, and Linné.) The search for meteors is futile until twilight is almost over, and at this eclipse looking for changes must depend upon the observer's knowledge of the normal full-moon appearance--nothing can be done before totality in this country.

We shall welcome reports of observations.

OBSERVATIONS AND COMMENTS

Among the lunar objects observed by Mr. H. P. Wilkins with the Meudon Observatory 33-inch refractor in April, 1952 was the crater Alpetragius. On Section VIII of the Wilkins map, this crater is not far southeast of the giant plain Ptolemy. In his drawing, Figure 2 on pg. 177, Mr. Wilkins gave chief attention to the very large central peak. He directs attention to the summit craterlet, clearly seen as such, and to the four rounded peaks surrounding the craterlet--altogether a remarkable object. Alpetragius may be seen well about a day after first quarter.

K. W. Abineri, 102 Chalk Hill Road, Wembley Park, Middlesex, England has submitted a drawing of the east wall of Grimaldi made with an 8-inch reflector under very favorable conditions, Figure 3 on pg. 167. This drawing is not in the customary astronomical orientation; instead, south is at the left and east at the top. Mr. Abineri is very anxious to learn whether other observers can confirm some of the small details shown on this drawing. We have few drawings of Grimaldi under low lighting in our files; but we urge that here is a suitable observing-project, especially for those A. L. P. O. members not now engaged on any systematic observing. Good results have been secured with apertures of six inches or occasionally even less. It will be found that the appearance of the detail will change very rapidly as the sun rises higher so that the period for best views of the floor and walls of Grimaldi may endure only some hours each lunation. Also, libration will somewhat affect the aspect of detail so near the limb. Again, clouds may hide the moon during the critical time; or bad seeing may conceal the finer detail. Nevertheless, the amateur lunar student who will persist in a close study of lunar topography in spite of these handicaps will find his reward in confirming or discovering now a new craterlet, then a row of peaks, again a thin cleft--in general constantly improving our charts of the surface of the moon. Such a study can become most fascinating, and Mr. Abineri has provided us with an excellent example to imitate. So how about drawing the Grimaldi east wall when you next find it properly lighted and submitting your sketch to us?

Alan P. Lenham, 43 Newcastle St., Swindon, Wiltshire, England has submitted a very detailed map of the Mare Humorum, reproduced on the back inside cover (pg. 181). It is remarkable that this map rests largely on personal observations by Mr. Lenham in 1949-52 with only a $3\frac{1}{4}$ inch refractor! There is obviously still work for the ambitious owner of a small telescope of good quality. Our British colleague intends to continue his painstaking scrutiny of Mare Humorum in the future and invites all interested persons to join him. Some readers may be especially interested in the "domes" which Lenham has discovered here; it is difficult to see how these Wargentin-like features can be explained by the meteoritical theory of the origin of the lunar surface formations. He has further found, as his map shows, a number of large, shallow depressions lacking walls and some "ghost rings" (like Stadius), the latter objects being visible only very near the terminator. Lenham reports that some of the features are rather irregularly visible, perhaps because of changing libration. We heartily congratulate Mr. Lenham on an outstanding piece of work!

O. C. Ranck, P. O. Box 161, Milton, Penna. has contributed drawings with a 4-inch refractor of these lunar craters in September, 1952: Timaeus on September 5 at colongitude 99°.0, Cassini on September 28 at colongitude 20°.1, and Egede on September 29 at 31°.9. Timaeus is on Section XV of the Wilkins map; it lies northwest of Plato and on the north shore of the Mare Frigoris. Made near full moon, Ranck's drawing shows the double-peaked central mountain, a small bright spot appearing to be a craterlet near the south end of the floor, another small bright spot or craterlet near the foot of the northeast inner wall, and a small black spot a little west of each bright spot. The Third Edition of the H. P. Wilkins 300-inch map of the moon shows none of these details except the two-peaked central mountain, which is also mentioned by Goodacre. Ranck was especially interested in the two black spots; and since the moon was full only 22 hrs.

before his observation, it is difficult to suppose that these can be shadows. Rather they must resemble the dark spots, of uncertain topographical nature, prominent under high solar lighting and found in Alphonsus, Hansteen, Atlas, Riccioli, and many other craters. Ranck's drawing of Cassini shows the two main craterlets on the floor, but a craterlet on the east inner wall to the northeast of Cassini B is difficult to identify on the Wilkins map. The drawing of Egede shows a near-central craterlet, a smaller craterlet in the southeast part of the floor, a mountain-spur running south from the north wall, and a curious white band connecting the central craterlet to the southwest rim. Also on Section XV of the Wilkins map, Egede lies east of Aristotle and near the northwest end of the famous Valley of the Alps. The detail shown by Ranck with a small telescope is rather surprising since Goodacre said on pg. 240 of his Moon (1931) that only Molesworth had recorded detail on the floor of Egede and since the few markings shown by Wilkins in the Third Edition of his map agree but poorly with Ranck's representation.

Donald Strayhorn, 527 S. Front St., Wilmington, North Carolina drew the lunar craters Messier and W. H. Pickering and their environs on October 1, 1952 at colongitude $57^{\circ}.1$, using a 4-inch refractor. These craters are interesting because of their considerable apparent changes in size and shape. The cycle of changes is repeated in its broad outlines, but perhaps not in detail, each lunation. Of course, we cannot seriously suppose that the walls shift their positions; rather the true outlines are not seen except under low solar lighting. It is a very curious fact that the eminent selenographer Maedler stressed that these two craters were exactly alike in every respect - size, shape, and even in the position of some small peaks on the walls! A 3-inch telescope is now capable of showing great differences between them.

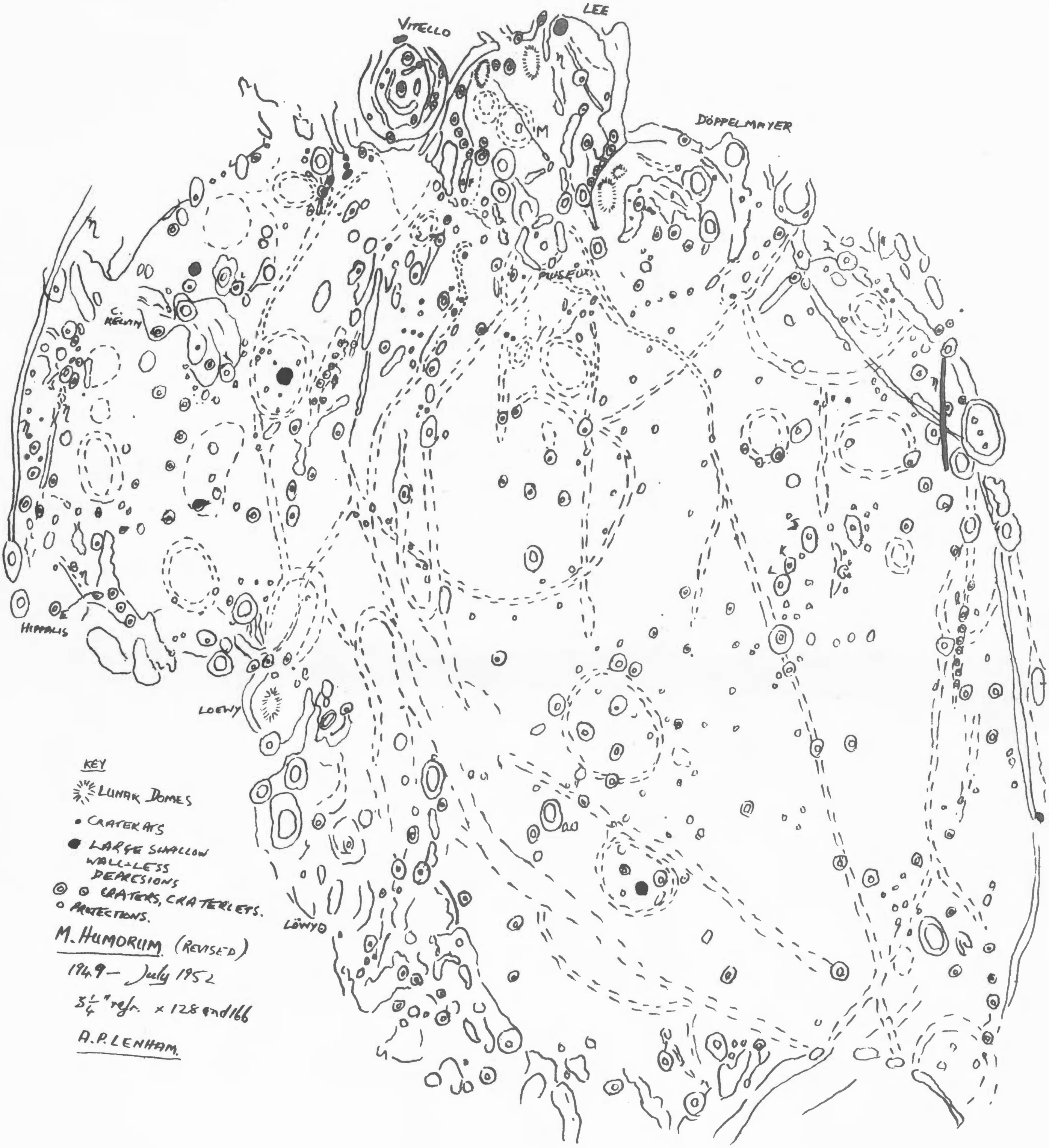
Miyamori's Valley, which joins the northwest rim of Riccioli and the southeast rim of Lohrmann on Section XIX of the Wilkins map, has interested Japanese observers in recent years. Drawings by Mr. Tsuneo Saheki, No. 29, Shi-Jutaku, Uriono-cho II-24, Sumiyoshi-ku, Osaka, Japan have been published in this periodical as Figure 3 on pg. 1 of the August, 1951 issue and as Figure 1 on pg. 107 of the August, 1952 issue. In a letter dated August 13, 1952 Mr. Saheki communicated these data on the Valley: Total length 94.6 ± 4.7 miles, length of west part 30.1 ± 3.5 miles, length of east and more conspicuous part 62.9 ± 1.7 miles, width of west part 1.2 ± 0.3 miles, and width of east part 3.2 ± 0.4 miles. He obtained these values by measuring drawings he made in 1951 and 1952 with an 8-inch reflector, assuming the following: diameter of Lohrmann 21.7 miles, lunar longitude of west end of Valley $65^{\circ}.9$ E., and lunar longitude of east end of Valley $69^{\circ}.6$ E. In recent months drawings of the Valley have been contributed by K. W. Abineri and P. A. Moore. Mr. Moore's drawing was with a 12.5-inch reflector at 350X on Spetember 2, 1952 at colongitude $73^{\circ}.9$. Thus observing under lower lighting than Abineri or Saheki yet have, Moore found the western part of the Valley to be bordered by a mountain spur on its south, there being a craterlet on the top of this spur near its east end. The north bank of the Valley was prolonged across the terminator as a bright spur, suggesting that it is slightly raised above the surrounding surface. Moore further remarked that the Valley cuts across two "old" rings and distorts the western wall of one of them. Abineri's drawing was on October 24, 1950 with an 8-inch reflector at 232X and colongitude $76^{\circ}.5$. He noted a pit at the west end of the broader eastern branch of the Valley. A bright spot just outside the east wall of Lohrmann was precisely in line with this pit and the eastern branch of the Valley, the western branch being absent from Abineri's drawing. Rather large differences exist among the drawings of Abineri, Moore, and Saheki, probably at least partly because of the effect of changing libration in longitude so close to the east limb of the moon.

C. Rex Bohannon, 3415 Santa Carlotta St., La Crescenta, Calif. last September completed a 16.5-inch reflector with a focal length of 84 inches and opened his observatory housing it. Mr. Bohannon thus has, to our knowledge, the largest telescope owned and regularly used by an A.L.P.O. member. We congratulate him on acquiring so great an aperture! Mr. Bohannon has masked down his telescope in an unusual way. His flat is supported by four evenly spaced arms, which may be regarded as dividing the mirror into four equal sectors. In each sector there is a hole in the mask which is as large as possible consistent with giving a clear aperture, the rays of light thus being nowhere diffracted by the secondary mirror or its supports. The diameter of each hole is necessarily less than half the diameter of the mirror, being about six inches in Bohannon's reflector. There thus results the resolving power of a 16.5-inch telescope (which would not be true with a single off-axis hole of the sort described) and the light-grasp of an unobstructed 12-inch telescope. The part of the mirror used by each hole has a focal ratio of 14. Mr. Bohannon declares that he has obtained very good views of the moon and the planets with this system. Such a masked reflector might indeed define better than a refractor of the same aperture, for it escapes both diffraction (except around the circumference of each hole) and chromatic aberration. Perhaps other readers would like to experiment with a mask of this sort on their reflectors. Bohannon's telescope has a short focal ratio of 5.1, and one may wonder whether the gain would be relatively as great on a long-focus reflector. We welcome correspondence on the subject.

A drawing of the lunar crater Schiller by Bohannon with his 16.5-inch reflector at 250X on September 29, 1952 at colongitude 34°.0 shows several craters on or near the walls. On Section XXII of the Wilkins map, Schiller is known for its peculiar shape.

A. P. Lenham has studied the dark bands on the walls of a number of lunar craters. He made observations in 1952 with a 3-1/4-inch refractor at 128X and 166X. Such bands are very plain on the east inner wall of Aristarchus. On February 12, 1952 Lenham drew dark bands in Kepler, Birt, Vitello A, and a crater east of Vitello A. In Kepler five dark bands radiated from a bright area in the center of the floor outward to the rim, one going to the southeast rim, one to the northeast rim, two to the north rim, and one to the south rim. The first two of these were definitely seen; the others were suspected. In Birt two somewhat curved bands originated at a dark spot near the west rim and ran, the one southeastward and the other northeastward, to the east rim. These Birt dark bands were very distinct. In Vitello A it was easily seen that the north half of the crater was darkened and that there was a dark band on the southeast wall. In the crater east of Vitello A three fairly clear bands radiated from a dark area in the northwest part of the floor, one going south, one west, and one east. On February 13 Lenham drew four faint bands in Vitello D; these again radiated from the center of the crater to the rim. The moon having been full on February 11, all the objects named above were observed under high solar lighting. On March 5, 1952, Lenham observed under morning lighting in Aristillus a tapering band, broadest on the rim, extending from the central mountin to the east rim. This dark band was dull and diffuse. In Lalande on this date he saw two fairly clear, bands in the east half of the crater. In Aristillus on March 14 he drew a dark band reaching from the central peak to the northwest rim. On the northwest inner wall this band is W. H. Pickering's "double canal", a test of telescopic definition. Lenham's work would suggest these very tentative conclusions to the Editor:

1. Dark wall bands are a very common feature of lunar craters.
2. They are sometimes curved and sometimes straight.
3. They often radiate outward from a point on the floor of the crater, perhaps usually near its center. The Meudon drawing of Aristarchus by H. P Wilkins shows the origin of at least one band to be near the central mountain (The Strolling Astronomer, Vol. 6, Figure 2 on pg. 96, 1952).



Map of Mare Humorum by A. P. Lenham. Based on Personal Observations with a 3-1/4-Inch Refractor in 1949-52.