# The Strolling Astronomer

ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS

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Parke H. Grubb, the First Optical Observer of the First American Artificial Satellite, the Explorer. Observation on February 2, 1958 near 2 hrs., 46 mins., Universal Time. Telescope Shown is a 5-Inch Refractor used by Holloman - Alamogordo, New Mexico Apogee Moonwatch Station. Observation Made with an M-17 Elbow Telescope (2 Inches of Aperture and Power 8 X).

THE STROLLING ASTRONOMER
1835 Evans Place
Las Cruces, New Mexico

# In This Issue

## ANNOUNCEMENTS

Concerning Our Last Two Issues. These two oversize issues were apparently very popular with our readers, and we thank you for your many kind remarks about them. We refer, of course, to the January-June, 1957 issue (Tenth Anniversary Issue) and to the July-October, 1957 issue (Second A. L. P. O. Convention Issue). Some confusion has understandably been created by these combinations with respect to the expiration of subscriptions. All that matters is the month of expiration. Thus, a subscription that ran out in August, 1957 would here be considered to expire with the July-October, 1957 issue.

These two issues are naturally more expensive than ordinary double issues. When sold by themselves, the prices are:

| | |
|---|---|
| Tenth Anniversary Issue | $1.50 |
| Second ALPO Convention Issue | 1.25 |

On page 26 of the January-June 1957 issue, the drawings of Jupiter were all made by Mr. Toshihiko Osawa of Osaka, Japan; we are very sorry for our failure to credit them properly. Mr. Osawa made these drawings during the 1955-56 apparition of Jupiter with a 6-inch reflector. On page 114 of the July-October 1957 Str. A. a decimal point slid astray in the first sentence of the last paragraph. Mr. Smith does not use a 150 H. P. Bodine synchronous motor to drive the polar axis of his 9.5-inch refractor; the correct value is 0.015 H. P.

Membership in Meteoritical Society. Readers who are seriously interested in meteoritics are requested to consider joining the Meteoritical Society. The science of meteorites is a fertile meeting ground of astronomy, geology, meteorology mineralogy, and other sciences - even psychology and economics, if one considers searches by the general public for fallen meteorites. Moreover, the study of meteorites can hardly fail to assume increased importance as Man begins to penetrate outer space; and it may not be wholly coincidental that the Russians are doing excellent work in this field. The cost of a new membership is six dollars, two dollars for initiation and four dollars for annual dues; application for membership should be sent to Dr. John A. Russell, Department of Astronomy, University of Southern California, Los Angeles, California. Members receive the journal Meteoritics, published by the University of New Mexico Press. The Society holds annual meetings, usually in the U. S. Southwest. The Editor will be glad to process applications from A. L. P. O. members; these should not be accompanied by other correspondence.

Der Sternenhimmel 1958. We acknowledge with thanks to Editor Robert A. Naef of the Swiss Astronomical Society at Zurich the arrival of this year's edition of this splendid astronomical handbook. It is written in German. In the United States Der Sternenhimmel can be purchased from Mr. Albert J. Phiebig, P. O. B. 352, White Plains, New York. The handbook includes a variety of astronomical data useful to the amateur.

## THE SATELLITE AGE

by

Walter H. Haas

It has often been said that we live in a changing world and that things are not as they used to be. Yet perhaps we may be forgiven for thinking these assertions especially applicable to our own times.

On October 4, 1957, the U. S. S. R. launched the first artificial satellite, a sphere weighing about 185 pounds. The radio transmitter in the satellite did not go dead until October 26, fully 22 days later. The rocket hull from which the satellite was ejected also remained in orbit, far more conspicuous than the satellite. Both bodies were observed over the whole world by radio and by optical methods, though visual data on the satellite were apparently scant. The rocket hull fell back to earth about the beginning of December; the sphere itself, probably in early January, 1958.

On November 3, 1957, Russia launched a second satellite, weighing more than 1,100 pounds and carrying a live dog. This vehicle has been a prominent naked-eye object and is still in orbit in late January, 1958.

There were widespread rumors that Russia might mark the fortieth anniversary of the Communist Revolution by sending a rocket to the moon on November 7, 1957. There was a total eclipse of the moon on this date, and one conjecture was that the lunar missile might cause an impact-flash while the moon was dimmed in the earth's shadow. Another guess was that red powder might be used to mark the site of the impact. Certainly many observations of the moon were made on and near November 7 in searches for these possible events. Results were negative, but it is widely expected that the experiments will be made at another time – and soon.

A tremendous amount of activity has been going on directed toward space travel. Other satellites, maybe by the dozens, will certainly be launched; and it is taken for granted that manned space stations will be established soon and that travel to the moon will be a reality in the fairly near future. Indeed, it is difficult for us to keep pace with the changing times. The idea of a lunar observatory as described by Dr. Dinsmore Alter of the Griffith Observatory less than ten years ago was then apparently received with some disdain by some high-ranking astronomers. Now missiles, rockets, and space flight cover the pages of our newspapers and magazines, and politicians emphasize the necessity of reaching the moon as soon as possible.

It is a tragedy that the immediate implications of the satellites are military and that the race for space goes on in such truly deadly earnest on both sides of the Iron Curtain. The rocket that can launch a satellite into an orbit around the earth can also carry a nuclear warhead thousands of miles to a key industrial city. The imminent stockpiling of bigger and deadlier missiles must make our world singularly precarious, with the devastation of the whole planet and the slaughter of much of the human race a possibility within the power of a frighteningly small number of key men. The satellites themselves are neither good nor bad, just as the airplane can be used either to carry needed medical supplies to an Eskimo village or to drop bombs on an undefended city. Of course, all the above is not to say that those responsible for the defense of the United States must not make every effort to meet the military challenge — we hardly have any choice. Whatever their future roles may be, the satellites just now imply the existence of weapons of unprecedented destructive powers and may well prove to be disastrous for humanity.

There are numerous other implications, of course. American readers will know of the considerable reëxamination of our education system in recent months, a result of the implied question as to why the United States did not launch the first satellite. Education deficiencies are serious and are not easily or quickly made up. If everyone could agree upon exactly what to do to produce more and better technicians and scientists in this country and if the remedial measures could be put into force at once, it would still be 10 or 15 years before notable practical results were achieved. Perhaps as a nation we have been too preoccupied with our own comforts and with being entertained. H. G. Wells, in his Outline of History, finds some evidence that the Romans of the fourth and fifth centuries, A. D. did not greatly exert themselves to defend the Empire against the barbarian invaders. They may have changed their minds after Alaric's sack of Rome and other defeats, but it was then too late. The national security may well demand far greater efforts on our part than a few billions more for missile development. If we value automobiles, television sets, and other gadgets above our way of life, we are hardly worthy to preserve this way of life. To take another point of view, satellite vehicles offer physical scientists opportunities for experiments heretofore impossible. The early satellites are presumably already supplying information about the density of the air at extreme altitudes, the precise shape of the earth, the frequency of micrometeorites in cosmic space, the propagation of radio waves through the ionosphere, the nature of the cosmic rays outside the atmosphere, etc. In the near future the physicist may be able to carry on experiments under conditions of little or no gravity. The meteorologist may receive truly worldwide weather data, which should permit more reliable and longer-range forecasts. The astronomer may possess a space observatory where the seeing is always perfect and where, for example, the solar corona and the Zodiacal Band can be studied continuously. Actual on-the-spot examinations of the surface of the moon, and later of Mars and Venus, will surely generalize geological concepts. The technological developments necessary to reach these goals will influence the lives of many of us, and in ways which we cannot at present even guess at. The realization of space travel must eventually have a great impact upon human thought, a tremendous influence upon religion and philosophy. Perhaps, indeed, these last effects will in the long run be the most important of all.

We may wonder what role the A. L. P. O. can play in all these developments. We would certainly appear to be in a singularly favorable position for the study of lunar missiles; we have a literally worldwide group of observers familiar with the moon and with adequate organization can keep the moon under almost constant day-by-day surveillance. New techniques may certainly decrease the importance of some of the classical methods for lunar and planetary astronomy. The recent solar photographs from a height of 80,000 feet above the ground ("Project Stratoscope", pages 112-115 of Sky and Telescope for January, 1958) suggest the possibility of occasional planetary photographs surpassing, for fine detail, what the visual observer can do on the ground. Until such photographs are common, however, we shall still need the classical methods to follow such cycles of changes as the seasonal melting of the polar caps of Mars and the sometimes rapid variations in the surface markings of Jupiter. It is possible too that professional scientists may sometimes desire amateur participation in certain projects, as with Moonwatch; if so, the A. L. P. O. does have a corps of trained and reliable observers. That lunar and planetary astronomy will make rapid advances seems assured. The mere fact that spectra will be obtained without the troublesome telluric lines and extending below 2,900 angstrom units (because above the earth's ozone) should do much for our knowledge of planetary atmospheres. With perfect seeing all the time and a moderate aperture, we may hope to solve such long-standing mysteries as the true appearance of the canals of Mars and of the dark hemisphere of Venus. Measures of very fine detail on photographs should tremendously increase knowledge of the rotation of the visible surfaces of Jupiter and Saturn.

A new Satellite Age has dawned; and Man stands at the threshold of his greatest adventure, if the disaster of a missile war can be averted. Let us hope, work, and pray that it will be. And then, in God's own time, the peoples of the twenty-first and later centuries may say of us: They achieved the first steps into space.

# THE OBSERVATION OF ARTIFICIAL EARTH SATELLITES BY AMATEUR RADIO OPERATORS

by

W. Richard G. Duane, K5BSD, and John M. Sharp, K5AKR

The audience was hushed as the buxom soprano approached the microphone and opened her lips to sing; but instead of the dulcet notes the public was awaiting there boomed forth from the concert hall's loudspeakers a bass voice harshly calling, "Hello CQ! Hello CQ! CQ fifteen meters!" Half a continent away, a little gray-headed lady cowered in a far corner of her yard as she viewed with fearful eyes a towering antenna being erected by her neighbor. "It'll fall, crush the house and kill us all in our beds!" she quavered.

Incidents like these have long typified the public's conception of amateur radio. A glance at the history of amateur radio, however, reveals that numerous contributions to science and technology have been made by "hams". It may be recalled, for example, that the use of frequencies above the broadcast band, once thought useless for communications purposes, was pioneered by amateurs; a vast body of data on propagation has been collected by thousands of radio amateurs throughout the world and has yielded interesting information about the composition of the upper atmosphere. Communications equipment design has been materially advanced as a result of amateur use and experimentation.

In recent months a new frontier has been opened for the radio amateur with the advent of the artificial satellite. The radio signals from the satellites' miniature transmitters have posed for him the question, "Can the radio amateur contribute substantially to the knowledge being gathered by these instruments, or must he be content with the role of a passive listener?" The answer as given by such responsible groups as the Naval Research Laboratory and the Smithsonian Astrophysical Observatory is that the amateur has a definite place in the ranks of contributing observers.

As a satellite observer, the amateur radio man has a number of advantages over the professional monitoring groups as well as an equal number of severe limitations. Since his equipment is installed at his home and is usually versatile enough (with minor modifications) to receive almost any frequency, he is able to get into action quickly. On the other hand, specialized, precise measuring equipment — i.e., laboratory-type frequency standards, recording oscillographs, and so forth — is usually beyond his reach. He is experienced in detecting weak signals under the most unfavorable conditions, but he may miss significant data through a lack of knowledge and scientific training. Though there are about a quarter of a million radio amateurs distributed over the globe, most of them have but limited time to devote to their hobby. And, of course, it must be realized that only a percentage of radio amateurs are interested in making satellite observations.

Probably one of the most important contributions of the amateur during the early life of a satellite is a rough preliminary orbit to facilitate the acquisition of the satellite by professional groups. This might prove especially helpful in the case of a satellite the orbit of which differed widely from that predicted, or an unannounced satellite on an unexpected frequency. For example, the authors, upon hearing of the Soviet sputnik, attempted to gather this type of data until the professional monitoring stations could be converted. Using a standard communications receiver (Hammarlund model HQ-140X), a seven megacycle dipole antenna and an inexpensive home tape recorder, we monitored the 20.005 megacycle frequency continuously for over fifty hours. A careful log was kept of signal strengths versus time. Our clock was synchronized with WWV, the National Bureau of Standards station, which was, for that matter, rather difficult to avoid monitoring, as the sputnik's signal

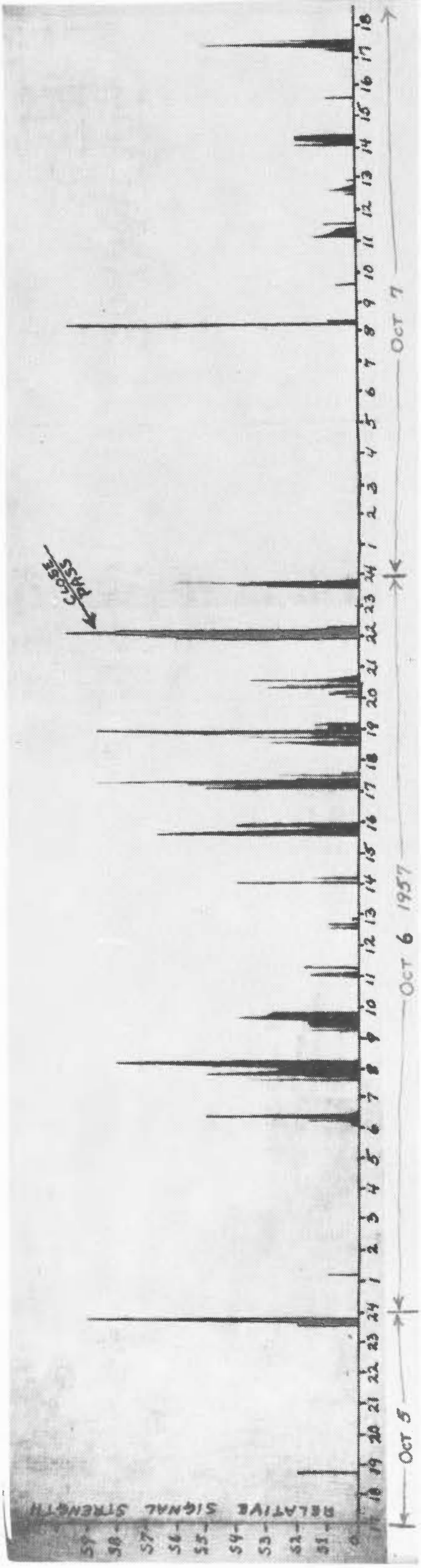


Figure 1. Relative signal strength versus time from 1700 MST, October 5, 1957 to 1800 MST, October 7, 1957. See article by Messrs. Duane and Sharp in this issue. (Add 7 hours to MST to obtain Universal Time)

was only 5,000 cycles from WWV's 20 megacycle transmission! Signal strength versus time was graphed (see Figure 1), and a pattern shortly became apparent. From the regular recurrence of the maximum signal point it was possible to verify the period announced by the Soviet radio. This, together with the announced height of apogee, made it possible to compute the height of perigee. The latter figure, as calculated on this basis, agreed favorably with computations of the height of perigee based on the assumption that the maximum signal strength was received at perigee and that the satellite was at that time dipping into or below the higher layers of the ionosphere. The Soviet radio later announced various points over which the satellite would pass and the times of passage. As may be seen in Figure 1, there is an unusually high peak with rapid fading occurring on October 6 at 2210 MST. This corresponded to an announced passage of sputnik over the immediate area of our receiver in El Paso, Texas. Since this seemed to verify the Soviet position announcements, we were then able to rough out an approximation of the orbit. (MST is the local time at longitude 105° W. and is seven hours earlier than Universal Time.)

Official sources state that it is during the first twenty-four hours of a satellite's flight that elementary information collected by amateur radio observers is of most immediate value. By the end of the first twenty-four hours official observers will presumably have determined the satellite's orbit to a degree of accuracy that will make limited reports valueless. The information requested in these preliminary reports is the following: (1) the frequency on which the satellite signal was heard; (2) time at which the signal was first picked up; (3) time at which the signal faded out; (4) approximate signal strength; (5) character of signal; (6) presence of modulation and its type if this can be determined. The amateur is directed to transmit this data to alerted radio nets in Washington, D.C., prefixing his transmission with "CQ DCS."[1]

It should be noted in passing that while the 108 megacycle frequency of the American satellites is above the tuning range of most amateur receivers, a number of commercially manufactured converters for this frequency are now on the market; or the interested radio observer may build his own converter, using a circuit such as that published in QST, November 1956, pages 11-15. The authors suggest that a make-shift converter might be improvised from the "front end" of an ordinary 88-108 megacycle FM receiver; a conical television antenna might be adequate for reception with sensitive equipment.

Tape recordings of satellite signals will be of value even after the first twenty-four hours, as the satellites will be instrumented, and a high fidelity tape recorder can adequately capture the telemetered data for subsequent analysis. In most cases, of course, the professional monitoring groups will have received all the data transmitted; but in some cases there may be gaps in the record which can be filled in by amateur recordings. In this regard, it has been suggested by members of Project Vanguard that amateurs record the signals and keep the tapes for forty-eight hours. If gaps appear in the official data, a call will be issued for the amateurs to send in their tapes. It is emphasized, however, that tapes should be sent in only if specifically requested.

The modestly equipped amateur can determine the approximate direction from which a satellite signal is being received by means of a simple directional antenna, provided the signal is fairly close to the design center frequency of the antenna.

For the amateur who wishes to make observations of a more sophisticated nature, recordings of Doppler shift of the received signals provide useful information. The Doppler shift varies as the satellite approaches and then recedes from the observer. From the slope of the Doppler shift plotted against time it is possible to compute the satellite's velocity and slant range. It is beyond the scope of this article to detail the computations involved, but the interested reader may consult the Proceedings of the I. R. E., A. M. Peterson, "Radio and Radar Tracking of the Russian Earth Satellite," November, 1957, p. 1553ff.

It is fairly easy to make measurements of the Doppler shift. With the velocities involved and a 108 megacycle signal, the shift in frequency amounts to about ten kilocycles on a zenith pass. A stable communications receiver with the beat frequency oscillator turned on provides an audio output which varies as the received frequency of the satellite changes.

If the observer has access to a decimal frequency counter, the frequency shift may be measured directly; but a method which is probably more feasible for the average amateur is to compare the audio output of the receiver with the output of a calibrated audio oscillator.[2] With three or more simultaneous Doppler measurements it is easy to calculate the position of the satellite, provided the observers are a reasonable distance from one another. If it is possible to make three or more such sets of observations, a fairly good approximation of the orbit may be obtained.

The main disadvantage of radio observations is lack of accurate position data. The long wave length used in the observations means an extremely large aperture is necessary. The authors are currently constructing a twenty-foot diameter parabolic dish, but even so large an aperture gives position errors on the order of $\pm 8^{\circ}$, since twenty feet is only slightly more than two wave lengths at 108 megacycles. A point of interest to telescope makers is that because of the large wave length the dish may depart from a true parabola by some six inches! No Foucault test needed here!

There is, however, a method of radio tracking capable of accuracies comparable to those of optical observation. This is the radio interferometer. For those unfamiliar with this equipment a brief description of this system may be of interest.

The radio interferometer consists basically of two antenna arrays spaced fifty to one hundred wave lengths apart. Receiving equipment is provided which detects the phase differences of signals arriving at the two antenna arrays. A single such system, of course, is ambiguous, since it provides position data in only one plane. Two such systems at right angles to each other are necessary to resolve the position of the satellite. There is additional ambiguity in the phase measurements, as it is not possible to determine whether the signals arriving at the two antennae are in phase, or out of phase by some multiple of 360°. This ambiguity may be resolved by the use of observations from several stations or by the addition of other groups of antenna arrays with shorter base lines. It is to be noted that the radio interferometer system just described is used by the official minitrack stations.

It is evident from the foregoing that a complete radio tracking station is quite expensive and hence beyond the reach of most individuals (though the authors are informed that at least one amateur radio club has undertaken the building of such a system). The reader interested in a more complete description of radio interferometer equipment is referred to John Firor's article entitled, "A Radio Telescope" in QST, September, 1957, page 32ff.

We trust that we have shown in the course of this discussion that every radio amateur interested in participating seriously in the radio observation of artificial satellites has a worthwhile part to play: the relatively untrained beginner with minimal equipment can make and report preliminary observations during the initial twenty-four hour period; the advanced amateur and groups with greater resources and knowledge can make more precise and exacting observations such as those described in the immediately preceeding paragraphs.

The radio amateur can, moreover, be highly useful to optical observers in his area by sharing with them radio data he has collected; by giving them his technical assistance with electronic equipment they may be using; and by rapidly relaying their data and queries to other optical groups. Indeed, in so simple a matter as making available to Moonwatch groups the WWV time signals the veriest novice might provide a valuable service.

Professional groups, for their part, can aid the amateur to coöperate effectively with them if they will educate him fully and exactly in the sorts of data-taking and communication services they require of him. Above all, the amateur should be impressed with the importance of keeping an accurate log of his observations. Representatives of interested professional organizations would do well to bring to the attention of local amateur radio clubs the desirability of their participation in the IGY program: for, lamentably, neither professional nor amateur groups seem as yet sufficiently conscious of the mutual value of such coöperation.

The potential alliance between workers in the field of angstrom waves and meter waves has become a working partnership with the advent of the artificial satellite. Man's exploration of the Solar System, once limited to the telescopic image, is about to acquire another useful perception means through telemetered signals from space vehicles. It is to be hoped that the future will see the development of the radio amateur into a skillful partner of the astronomer.

Footnotes

[1] In "What To Do About Satellites", QST December, 1957, p. 15, it is stated: "The following Washington area nets will be on the air for the 24-hour period immediately following news of a satellite launching:

| CW | | Phone | |
|---|---|---|---|
| MDD | 3650 kc. | Maryland Emergency Phone Net | 3820 kc. |
| VN | 3680 kc. | VFN | 3835 kc. |
| TCRN | 7042 kc. | Cracker Barrel Net | 28,600 kc. |

"Washington stations also will be monitoring the following National Calling and Emergency frequencies during the same period:

| CW | | Phone | |
|---|---|---|---|
| 3550 | kc. | 3875 | kc. |
| 7100 | kc. | 7250 | kc. |
| 14,050 | kc. | 14, 225 | kc. |
| 21,050 | kc. | 21, 400 | kc. |
| | | 29, 640 | kc. " |

[2] This method is more fully described by C. L. Stong, "The Amateur Scientist", Scientific American, January 1958, page 98.

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Firor, John "A Radio Telescope", QST Magazine, September 1957, page 32ff

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Whipple, Fred L., and Hynek. "Observations of Satellite I", Scientific American, December 1957, page 37ff.

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Note by Editor: Our contributors may be reached by writing to Dr. John M. Sharp, 724 Kern Blvd., El Paso, Texas. We thank them for a very helpful and informative article.

## THE NOVEMBER 7, 1957 LUNAR MISSILE ALERT

by

Walter H. Haas

In the autumn of 1957 there were rumors that Russia would attempt to commemorate the fortieth anniversary of the Communist Revolution on November 7, 1957 by firing a missile to the moon. The fact that there was to be a total eclipse of the moon on that date gave rise to guesses that the missile would impact on the lunar surface during totality, permitting the resulting flash to be seen with comparative ease. Others thought that since a great element of chance enters into the observation of so brief an event as an impact-flash, the Russian missile would mark the lunar surface more permanently with some kind of powder, perhaps red and in any event so chosen as to be recognized at once as artificial and new. These rumors never received any confirmation from responsible Soviet sources, to my knowledge; and yet it may be worth mentioning that I received, on November 6, an indirect telephone request from a large American observatory to observe a predicted impact pinpointed in time to within a few minutes. At any rate a circular was mailed to a limited number of A. L. P. O. members at the end of October, 1957, describing the possibilities outlined above and inviting a very careful watch of the moon on and near November 7. It would certainly have been better to circularize the whole membership, but time and costs did not permit doing so.

Some may wonder why we should not attempt to observe a lunar missile throughout its flight so that we would be well prepared to observe the impact and attendant events, instead of being vexed with the uncertainties indicated above. The missile is too dim to allow doing so. Mr. Clyde Tombaugh has computed that a German V-2 rocket, seen broadside and painted white, would have a stellar magnitude of fifteen at the distance of the moon. A lunar missile would at present be the final stage of a multiple stage rocket and would be much smaller than a V-2. Nor would it always be broadside to us. The visual detection of so dim an object moving very slowly among the hosts of background stars is not to be expected. A photographic search might at first seem more hopeful but not when we remember that the missile during most of its flight will be within a few dozen degrees of a moon on this occasion close to full. The full phase condition may not apply to future lunar missiles, however, giving more hope of successful photographs.

We shall now give in some detail the results of A. L. P. O. searches communicated to us. A number of other colleagues wrote that they had prepared to observe but were frustrated by clouds. Unquestionably a great many searches were carried out besides those recorded here. It will also be well to remind ourselves of the circumstances of the total lunar eclipse:

| | | | | |
|---|---|---|---|---|
| Moon enters umbra | 1957, November 7th | $12^h$ | $43^m$ | U. T. |
| Total eclipse begins | | 14 | 12 | |
| Total eclipse ends | | 14 | 42 | |
| Moon leaves umbra | | 16 | 10 | |

These times show that the early stages of the eclipse could be observed on the U. S. West Coast, while Japan had an extremely good view.

Richard Kent Angel, Henry Squyres, and Paul Nemecek. Whittier College 18-inch reflector, Whittier, California. These observers worked in shifts to keep a continual watch on the moon from $11^h$ $45^m$ to $14^h$ $5^m$, U.T. Nothing unusual was observed.

B and C Observatory. San Jose, California. Their results also were negative, though clouds interfered with the eclipse.

Jack A. Borde, Clarion Cochran, David Stienmetz and Donald Noble. Concord, California. These observers operated a 3-inch refractor, a 3.5-inch reflector, a 15X Spotting Scope refractor, and a 6-inch reflector from $11^h$ $20^m$ to $14^h$ $10^m$, U. T. on November 7. Throughout this period at least two observers were always watching the moon, and usually all four were watching. Mr. Borde continued up to $14^h$ $20^m$ with the driven 6-inch reflector, though the eclipsed moon was then invisible on the bright dawn sky. Nothing was seen.

Charles M. Cyrus. 10-inch reflector. Baltimore, Maryland. Searches were made with 3.5 inches of aperture and 135X, showing almost the whole moon, from $23^h$ $30^m$ on November 6 to $0^h$ $58^m$ on November 7 and from $1^h$ $20^m$ to $1^h$ $51^m$ on November 7. Nothing was seen. The moon was scanned with the full aperture and 323X from $23^h$ $25^m$ to $23^h$ $30^m$ on November 6, also with negative results. (All times by U.T.)

Detroit Astronomical Society. Dr. Donaldson Craig reports that thirty members watched "practically all night" and saw nothing out of the ordinary, even though assisted by unusually good seeing. At the position of Detroit, Michigan, we would guess that the search extended from about $0^h$ to about $8^h$, U. T. We congratulate our Detroit friends heartily on a truly remarkable society-effort.

Paul R. Engle and Others. Edinburg, Texas. 17-inch reflector, 6-inch refractor. Four observers kept the two telescopes in continuous use on November 7, for $9\frac{1}{2}$ hours, probably from about $2^h$ $30^m$ to about $12^h$, U.T. There was average seeing, some haze throughout the night, and occasional high clouds that hid the moon. The observers saw no change or anything unusual. They express their keen interest in possible future lunar alerts of this kind.

Joel W. Goodman, Frank Manasek, and Mike Magaldino. New York, New York. Mr. Goodman reports as follows for the group, times being by Universal Time on November 7:

Mike Magaldino. $0^h$ $0^m$ - $3^h$ $5^m$. 2.4-inch refractor, 55x-124x.

Frank Manasek. $0^h$ $0^m$ - $3^h$ $5^m$. 3.2-inch refractor, 80x - 155x.

Joel W. Goodman. $1^h$ $0^m$ - $2^h$ $15^m$ and $9^h$ $30^m$ - $9^h$ $45^m$. 8-inch reflector, 90x - 180x.

All observers had poor seeing and good transparency, and observations were uninterrupted over the time intervals noted above. Nothing unusual was remarked.

Walter H. Haas and John Stucky. Las Cruces, New Mexico. 12.5-inch reflector at 101x and 6-inch reflector at 94x. With the larger telescope the search was effective for about 90 percent of the full moon and for about 90 percent of the time. Wratten Filter 58 (green) was frequently employed to dim the moon. The seeing was usually fair, and the sky was very clear. Haas watched with the 12.5-inch from $2^h$ $30^m$ to $3^h$ $42^m$ and from $6^h$ $15^m$ to $6^h$ $28^m$ on November 7; he then looked briefly for possible novel lunar features near $6^h$ $36^m$ with a higher power of 202x. Stucky and Haas observed with the 12.5-inch from $9^h$ $45^m$ to $12^h$ $50^m$, the observer off duty sometimes using the 6-inch. They repeated this effort on November 8 from $2^h$ $11^m$ to $5^h$ $0^m$. All times are by U.T. — and all results were negative.

William K. Hartmann. State College, Pennsylvania. On November 7, he watched the moon with the naked eye from $9^h$ $8^m$ to $9^h$ $24^m$, U.T., having in mind a possible nuclear bomb explosion. He then used a Moonwatch telescope, effectively about a 1.5-inch refractor, from $9^h$ $46^m$ to $10^h$ $1^m$ and from $10^h$ $28^m$ to $10^h$ $42^m$. On November 8 he scanned the moon with a 5-inch refractor at 90x, fair seeing and poor transparency, looking for prominent unusual bright or colored spots. All results were negative.

Alika K. Herring. South Gate, California. 12.5-inch reflector. Observations began at about $9^h$ and terminated in the telescope at $12^h$ $40^m$ (moon went behind a building), with the eye at about $14^h$ $30^m$. "Results were absolutely negative".

David Hibner, William LeCates, and John Shedlock. York, Pennsylvania. These observers worked in shifts from $5^h$ $0^m$ to $10^h$ $0^m$, U.T. on November 7. They sighted nothing. The instrument used is not identified.

Craig L. Johnson. Wichita, Kansas. 4-inch reflector. On November 8, with ordinary seeing and perhaps somewhere near $3^h$, U.T., Mr. Johnson with 167x could find no unusual spots or appearances on the moon. On November 9 with excellent seeing he repeated the attempt, using both 167x and 267x, but still saw nothing out of the ordinary.

Lyle T. Johnson. Welcome, Maryland. 16-inch reflector. He observed on November 6 from $9^h 30^m$ to $9^h 41^m$, U.T. and "saw no evidence of rockets striking the Moon", employing $3\frac{1}{2}$ inches of aperture at 80x. On November 7, he made 178 photographic exposures, from $1^h 21^m$ to $2^h 11^m$ and again from $5^h 43^m$ to $7^h 14^m$, when fog and dew terminated work. He watched visually between exposures but saw nothing unusual. On November 12 he made 112 more exposures. The seeing was good on both November 7 and 12. On November 20 Mr. Johnson wrote: "I enlarged a few of the better negatives and was rather pleased with the results.....So far, I have found nothing unusual on the photographs taken before the eclipse. In selecting negatives to be enlarged I examine them with a magnifying glass but could easily miss the flash of an explosion unless it were quite conspicuous". We congratulate Mr. Johnson on this remarkable and valuable photographic effort, which certainly strengthens our negative conclusion substantially.

S. S. Kibe'. Shiga-ken, Japan. Assisted by two friends, this observer watched the moon during the lunar eclipse (times given above) with a 324-mm. reflector at 60x and an 80-mm. refractor at 50x. The moon was often obscured by clouds. The result was negative; no flash or colored spot was seen on the lunar surface.

K. Komoda. Miyazaki City, Japan. He saw nothing between $12^h 30^m$ and $16^h 0^m$, U.T. on November 7, probably using an 8-inch reflector.

Lincoln LaPaz and Others. Albuquerque, New Mexico. A team of observers at the Institute of Meteoritics of the University of New Mexico worked in pairs with these instruments: 15-inch Cassegrain reflector, 4-inch refractor, 16-power battery commander binocular telescope, and field glasses of 12, 10, 8, and 6 power. The eclipsed surface of the moon was visible from $11^h 30^m$, U.T. until moonset (near $13^h 30^m$) with only brief interruptions from clouds. "No flashes or other luminous phenomena of any sort were observed". Dr. LaPaz personally surveyed the moon for possible after-effects on November 8, probably near $3^h$ or $4^h$, U.T. "Although I searched the moon's disc carefully, I could discover nothing whatever out of the ordinary".

Hal W. Metzger. Alfred Station, New York. 8-inch reflector, 4-inch refractor, and 5-inch OG-RFT refractor. A four-hour period of observation on November 7, perhaps from about $0^h$ to about $4^h$, U.T. with poor seeing and poor transparency yielded negative results.

Toshihiko Osawa. Osaka, Japan. 6-inch reflector. He observed the eclipse under favorable conditions, except near its end. "The seeing was not so bad as to prevent me from discovering any impact flash of Russian missiles. In spite of my scrutinizing the dark side of the moon (from $12^h 10^m$ to $15^h 45^m$, U.T.) with 55x, no such unusual phenomena were to be found, though I must add that I left the telescope (for adjustment of the telescope) at $13^h 43^m$ - $46^m$, $14^h 40^m$ - $45^m$, $15^h 0^m$ - $4^m$, $15^h 20^m$ - $25^m$, and often just for a moment for recording what I observed". Mr. Osawa writes that negative results were also obtained by Mr. Tsuneo Saheki and at the Mt. Ikoma Astronomical Museum.

Cecil Post and David Post. Las Cruces, New Mexico. 6-inch reflector. The telescope was employed at 60x with a crossed polaroid filter, to reduce the glare of the full moon; the field of view was about 48 minutes of arc and thus easily included the whole moon. The two observers worked alternately on November 7, from $10^h 45^m$ to $11^h 45^m$ U.T. and then again from $12^h 30^m$ to $13^h 17^m$. At the start the seeing was fair, and the transparency was good; by the end the moon was very low on a dawn sky, and both seeing and transparency were bad. Results were totally negative.

Clyde H. Ray, III. Waynesville, North Carolina. 6-inch reflector at 72x. The observer worked on November 7 from $1^h 30^m$ to $4^h 45^m$ and again from $6^h 45^m$ to $8^h 0^m$, U.T. with a few breaks. The seeing was better during the first period than during the second one. Several curious objects were suspected, but they were not definite to Mr. Ray and have not been confirmed by other observers.

David W. Rosebrugh. Meriden, Connecticut . This observer watched the moon with the naked eye on November 6 from $21^h 45^m$ to $22^h 1^m$ and from $22^h 5^m$ to $22^h 30^m$, U.T. He then observed with a 4-inch refractor at 40x at $22^h 33^m$ and at $23^h 15^m$. A 6-inch refractor at 76x, and rarely 144x, was employed on November 6 from $23^h 25^m$ to $23^h 45^m$ and on November 7 from $0^h 30^m$ to $0^h 40^m$, from $2^h 15^m$ to $2^h 45^m$ and from $3^h 15^m$ to $3^h 20^m$. Mr. Rosebrugh was now looking for a red spot and employed red, orange, and blue color filters in this search. He observed again on November 8 at $3^h 30^m$ and on November 11 from $2^h 0^m$ to $2^h 30^m$, again employing the 6-inch refractor at 76x and 144x and with color filters. He looked very carefully for a possible colored marking and could find none; he thinks that any brilliantly colored spot as much as 0.5 miles in diameter would have been detected. However, all his searches gave negative results. Mr. Rosebrugh writes that several other observers in the U.S. Northeast also had negative findings.

F. Salomon. Haifa, Israel. His own telescopes being temporarily dismantled, Mr. Salomon alerted his friends. They observed, with negative results, the last phases of the eclipse, from about $17^h$ U.T. on. It is their intention to maintain this watch in the future, particularly near new moon.

Takeshi Sato. Hiroshima, Japan. 6-inch reflector. He observed carefully during the total lunar eclipse and used a chronograph to record the time of any possible impact-flash, but no unusual appearance was observed. "Other members of the Astronomical Society of Hiroshima University also watched the moon with a 3-inch refractor, two 4-inch reflectors, and an 8-inch reflector; but they could not detect any unusual phenomena." He mentions that many other Japanese observers watched the moon with the same negative results. Mr. Sato also saw no lunar meteors during the eclipse.

Raymond Schmidt. Chloride, New Mexico. 12-inch reflector. He saw nothing unusual on the moon when it was setting near $13^h$ U.T. on November 7.

A. G. Smith. Gainesville, Florida. 8-inch Clark refractor at University of Florida Observatory. Dr. Smith maintained a lunar watch on November 7 from $9^h$ up to about $11^h$, using a 90x ocular which just allowed the full moon to fill the field of view. "Observing conditions were good, but I saw nothing of interest".

Eugene Spiess and Others. Manchester, Connecticut . 5-inch refractor. They observed at the following times, with completely negative results: November 6-7, $23^h 15^m$ - $0^h 15^m$; November 7, $0^h 35^m$ - $1^h 15^m$, $1^h 20^m$-$1^h 42^m$, $2^h 15^m$-$2^h 26^m$, $2^h 50^m$ - $3^h 52^m$, $4^h 15^m$ - $5^h 1^m$, and $5^h 20^m$ - $6^h 4^m$; November 8, $1^h 20^m$ - $2^h 5^m$, $2^h 23^m$ - $3^h 10^m$, and $3^h 25^m$ - $4^h 3^m$; November 10, $2^h 16^m$- $4^h 3^m$, all by U.T.

Frank J. Suler. Holloman Air Development Center, New Mexico. 8-inch reflector at 58x, 125x, and 203x but chiefly the lowest power. (Only part of the moon was visible with 125x and 203x.) A Y2 filter was employed in all observations. On November 6 two observers, Shelly Winters and Frank Suler, observed the moon continuously from $2^h 30^m$ to $3^h 15^m$, U.T. and saw nothing unusual. On November 7, Mr. Suler observed at these times: $1^h 28^m$ - $1^h 43^m$, $2^h 1^m$ - $2^h 6^m$, $3^h 47^m$ - $4^h 33^m$, $6^h 8^m$ - $6^h 54^m$, $7^h 59^m$ - $8^h 42^m$, $9^h 0^m$ - $9^h 42^m$, $10^h 0^m$ -$10^h 30^m$, $10^h 45^m$ - $11^h 15^m$, and $13^h 2^m$ - $13^h 15^m$. The seeing was rather poor. Results were negative, though a few birds were seen to cross the moon. We commend Mr. Suler's persistence in this 12-hour vigil!

Clyde W. Tombaugh. Las Cruces, New Mexico. On November 9, Mr. Tombaugh systematically scanned the illuminated portion of the moon's surface (two days after full moon) from $12^h 55^m$ to $13^h 25^m$, U.T. A magnifying power of 225x was used on an 8-inch off-axis (unobstructed) reflecting telescope. The seeing was unusually good, 5 to 7 on a scale of 0 (worst) to 10 (perfect); and the lunar surface was so loaded with fine detail that it required a full half hour to cover it. The observer remarks: "It is estimated that any stain spot of unnatural color as small as one-half mile across would have been detected. It is tentatively concluded that the Russians did not place any lasting visible marker on the moon on November 7, 1957." This opinion is the more weighty because of the favorable view and Mr. Tombaugh's considerable experience with lunar observations. He also observed, with negative results, at other times on and near November 7.

We might mention that we have learned indirectly of a rather surprising lunar observation, an apparent explosion on the lunar surface at or near the position of Aristarchus. Observations of this portion of the moon between $2^h$ $50^m$ and $6^h$ $30^m$, U.T. on either October 12 or October 13, 1957, may shed some light on the matter and are hence requested. We prefer to give no further details at this time. It appears probable that Aristarchus and its environs were not altered to any marked degree, or else a change in such a familiar object would have caught the attention of our observers on and near November 7, 1957.

The results of our November 7 vigils were, then, entirely negative, as negative as negative can be. Yet in a way we can be glad for this fact because it shows the A. L. P. O. to be capable of making honestly negative observations even when a positive report might make sensational headlines. Our duty is always to observe what exists, not what we may wish to see.

The data above can be tabulated and studied in various ways, but the sufficiently interested reader can do so fully as well as the writer. It may be noted, however, that our A. L. P. O. "alert" did achieve rather complete coverage of the moon from about $23^h$ on November 6 to about $16^h$ on November 7, Universal Time and again for a couple hours near $2^h$ on November 8. This time coverage was possible only through the coöperation of observers in different longitudes, specifically in Japan and in the United States. The gap between $16^h$ on November 7 and $2^h$ on November 8 is due to a lack of reports (one received) from those countries west of Japan and east of the United States. Of course, the coverage we here desire is most easily achieved at full moon. When the moon is within a few days of new, very well-planned coöperation between observers in all longitudes would be essential to complete coverage of the moon, which is then observable for only a short time from a given location.

It seems very probable that missiles soon will be fired to the lunar surface and also put into orbits around the moon, perhaps even before the end of 1958. We can thus profitably consider how we may best observe such objects in the future. Careful observations of the impact of a missile upon the lunar surface may well give useful information about the nature of that surface. Unless, however, we are prepared to attempt a literally constant survey of the lunar surface, we shall have no more than a few days of advance warning prior to such impacts; and it will probably be necessary to employ radio communication to alert our observers. If a lunar missile could be photographed on its way to the moon, a thing easiest when the moon is a narrow crescent and does not light the sky much, it might be possible to predict the time of impact with comparative accuracy. The alternate of a constant, round-the-clock, and round-the-world survey of the lunar surface is rather difficult to set up with adequate planning and in sufficient detail for widely separated amateur observers; and we have never satisfactorily solved the much simpler problems posed by systematic, duplicate searches for possible lunar meteors. One might, of course, hope for some other benefits from so much looking at the moon; certainly some intelligent interest should be thus engendered. At any rate we do have in our A. L. P. O. a fairly large number of experienced lunar observers scattered over the whole world; and we certainly must try to use their talents to best advantage in the dawning space age.

# THE ALPO COMET SECTION

by

D. Meisel, Comet Recorder

Because of its unique position among the other sections of the A. L. P. O, it is necessary to give a few of the aims and particulars of the section. At the time of the section's formation, it was realized that in order to accomplish the aims of the section, several unusual requests would have to be made. Here are the aims of the section:

1. Compilation of an extensive file of amateur cometary observations.
2. Provide useful information to all observers through articles in The Strolling Astronomer.
3. Publish and distribute to section members ephemerides for comets as soon as possible after discovery.
4. Act as a liaison between amateur and professional cometary observers and promote programs of mutual interest.
5. Strive for international cooperation among interested cometary observers.
6. Publication of observations which might otherwise be ignored because of lack of correlating material.
7. Give due recognition to those who participate in the section programs, regardless of intrinsic value or worth of the contribution.

In order to achieve the above aims the following stipulations must be made:

1. All active members of the section must be A. L. P. O. members.
2. Application for membership must be made directly to the Comet Recorder.
3. Specially prepared announcements will be sent only to those A. L. P. O. members, not section members, who request the service.
4. The announcements will be sent free of charge to A. L. P. O. members. Non-members of the A. L. P. O. will be charged a nominal fee for the service.
5. Observations should be sent as soon as possible after they are made.
6. A. L. P. O. members should encourage non-members to participate in the section activities whenever the need arises.
7. Section members will be provided with standard visual report forms. (Note: All observers are encouraged to use the 4x6 cards when making routine reports to the section. The report form cited in the Recorder's article in the Sept-Oct. 1956 issue of Strolling Astronomer should be used as a guide. Name and address of observer should always be noted on the form in addition to the other information.)

Below is an outline for the various programs of the section:

I. Photometric Observations

A. Visual. Any optical aid can be used depending on size and magnitude of the comet. A photometer of the type described in the Recorder's article on cometary photometers in this issue can be used to advantage. A rule to apply to this question is: For comets of 30' of arc or smaller, $f8$ to $f15$ are suitable; larger than 30' of arc, $f8$ or less can be used. Also for comets of greater than 6th magnitude, instruments over 2 inches aperture should be used. Always keep in mind that the magnitude threshold for extended objects can be as much as 2 magnitudes fainter than for point images.

B. Photographic. Prime focus cameras on telescopes, generally following the rule above for instrument size. For bright comets guided photographs with regular cameras are valuable. These have a function in other programs besides photometry when large plate scales are used: i.e., external detail, position.

NOTE: Although a photometer is recommended for visual work it is not necessary to have one to participate in the photometry program. The extended image method can be used to some advantage. It can be done in the following way: Find three stars of a magnitude near that given for the comet. Locate them in the cometary field for further reference to obtain their exact magnitude. Memorize the size and brightness of the focused image of the comet. Then rack-out the eyepiece until the star images appear to be the same size as that of the focused image of the comet; then, proceed to estimate the brightness of the focused comet image in terms of the three star images by step estimation. The comet's magnitude can later be interpolated from the known stellar magnitudes.

II. Internal Detail

A. Visual. This can be done with any size instrument for which the comet is about 4 magnitudes brighter than the threshold for the instrument. The magnification used should be comparable to that used for similar planetary work. A drawing should include scale and orientation. Magnitude of the nucleus may also be included as this is separate from the total magnitude estimates mentioned above.

B. Photographic. Planetary cameras can be used to supplement the visual observations, especially with reference to the size and general shape of cometary detail.

III. External Detail

Only photographic equipment of large light grasp should be used. The main purpose is to correlate data from internal changes with faint changes in tail structure that cannot be observed visually.

IV. Positional Measures.

Requires some type of micrometer and a telescope large enough to clearly see the nucleus of the comet and make accurate measures of its position. All measures must have an accuracy of at least 1' of arc for newly-found objects and 1" of arc for comets with an established preliminary orbit. Under the heading of positional measures comes comet searching. A later paper will describe this phase of work in detail. Photographic positions of the nucleus are required to compute residuals of a known orbit. These positional measures will be necessary to the section if orbit computation is to become a reality.

V. Special Research

Equipment for photoelectric photometry, polarimetry, and spectroscopy is necessary to carry out highly specialized work usually done only by professional astronomers. Because of other more pressing work the professional may not be able to do this research. It must then be carried on by the amateur. The Recorder hopes to contribute possible research themes in future articles.

It is hoped that members of the A. L. P. O. and others will chose a definite program of observation. For those who don't chose a definite line to follow, a general report on any comet will be appreciated. Unless some bright comets appear, the Recorder is planning to write a series of articles which, when completed, will comprise an A. L. P. O. Comet Handbook. Each article will deal with one of the above mentioned subjects. The first will be on internal detail and structure of comets and methods of observing them. It is hoped the articles will help the amateur to choose a program which will fit his abilities. Since the Recorder's time is limited because of his college attendance, personal replies to letters can only be given if requested or if the situation requires them.

The Recorder would like to thank all those who have made the section become a reality and welcomes to the section all those who are interested in comets and related subjects.

## A VISUAL COMETARY PHOTOMETER

by

D. Meisel

Perhaps the most perplexing problem of cometary astronomy is that of magnitude. Magnitude means the integral light that an object possesses or appears to have. With point images such as stars, brightness and magnitude can be used interchangeably as descriptive terms. In extended images such as comets and nebulae, the terms are much differently used. For example, let us suppose that a comet is observed with a 6-inch RFT to have an apparent surface brightness of 1st magnitude when compared with the point images of the surrounding stars. When viewed with a 6-inch or 8-inch $f12$ scope under the same magnification and seeing conditions, the estimated brightness usually given is about 0.5 magnitudes brighter for the nucleus and as much as 1.5 magnitudes fainter for the total light of the comet. Thus ordinary methods of brightness estimation are unsuitable for this type of work. A method called the extended image process has been used with some improvement in agreement of values, especially with magnitude of small, fainter comets. No method of estimation has been completely satisfactory.

With these problems in mind, a photometer and a uniform magnitude estimation system have been devised. Basically the photometer operates on the system of extending artificial images by a separate operation from focusing and unfocusing the stellar images in the comet's immediate neighborhood; this system completely eliminates the need for memorization of the comet's focused image while searching for a star image with an out-of-focus appearance like that of the comet with respect to brightness and size. For purposes of discussion, the photometer will be divided into different stages: field, image size, and magnitude.

The field stage consists of the eye end of the apparatus and movable ground glass screen (see Fig. 2). The eye tube is not shown but the eye is in the observing position. The tube is adjusted so that the distance from the eyepiece of the scope enables the observer to view the photometer screen simultaneously with the telescopic focused image. "A, B, C" on the figure are the varying positions of the ground glass image projection screen: "A" is the position for wide-angle eyepieces, and "C" is the position for narrow view fields.

The image size stage consists of the short focus anastigmat or similar lens mounted on a movable rack-and-pinion along with the d. c. pinhole light source. Positions 1 and 2 denote difference of projected image diameter with light source-to-screen distance. The design of the light source is such as to permit changing

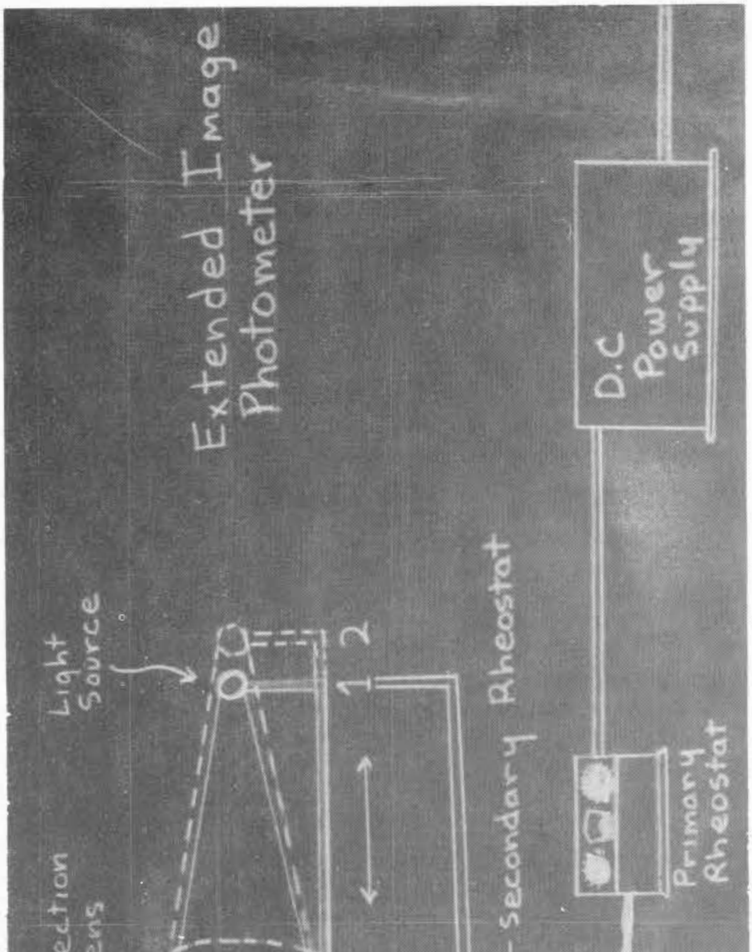


Figure 2. An Extended Image Photometer Proposed by D. Meisel for Measuring the Brightness of Comets. See his Article "A Visual Cometary Photometer" in this Issue.

projection images, for various cometary shapes (see Fig. 3).

The magnitude stage consists of power source and rheostats which are connected to the light source. The power source can be any reliable d. c. rectifier Batteries may be used in the field. Connected to the power source is a large-range rheostat. This enables the photometer to be used over a wide range of magnitudes and instruments. A second rheostat is attached to the circuit; this one should be of a very sensitive nature so as to produce an apparent magnitude change of tenths or hundredths of a magnitude. As the apparent effective range of a given rheostat varies with the size of the instrument, various types will have to be tried experimentally to determine which is the best for a given range.

Although the operation of the type of photometer as described above will vary according to the individual design, a general procedure for the use of such a photometer can be described. Of course, the first thing to do is to build the apparatus. This may be done in a variety of ways, all depending on the skills and financial status of the observer. However, any enterprising telescope maker can construct one by following the general requirements as given above.

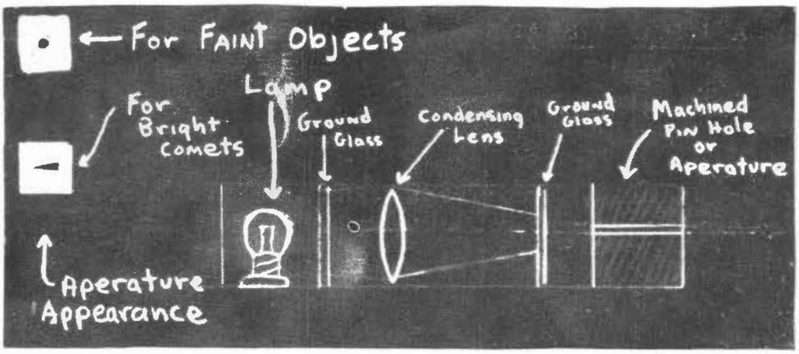


Image Size Stage of an Extended Image Photometer Proposed by

D. Meisel

Figure 3.

After the constructed photometer is correctly adjusted for eye distance with the scope eyepiece, the first adjustment to make is to move the ground glass screen until it is the exact size of the eyepiece field; that is, the field limits should coincide when viewed stereoscopically. When the fields are aligned, a star of known magnitude should be centered in the scope field. The lens system is then racked in or out until a point image is projected on the ground glass. While comparing the brightness of the two images, the observer adjusts the brightness of the comparison image so there is no magnitude difference between the images. This process is continued for stars within the brightness range of the object for which a measurement is to be made. The settings on the rheostat dials should be noted for each comparison of magnitude. A scale giving direct magnitude readings can then be constructed and used for observing. The focused image of the comet is then put in the field and the photometer image is expanded to the exact size of the cometary image. After making settings for the size, the rheostat adjustments are made until the two images coincide exactly in brightness. The true magnitude is then read from the scale previously mentioned. The process can be repeated to adjust the photometer to any size telescope or even to naked-eye observing. The results of these observations should be as accurate as those obtained photographically.

In practice the photometer could even be made to measure the size of a comet as well as total magnitude. The writer would appreciate examining any proposed designs of a cometary photometer constructed by A. L. P. O. members. The capabilities of this instrument can not be evaluated at this time. However, the writer feels that such an instrument can make a contribution to the field. The only limitations to its function will be the lack of ingenuity on the part of the observer.

The readings from the photometer can be evaluated in this manner:

(1) Magnitude readings will be uniform from instrument to instrument. The magnitude deviation from observer to observer should be no greater than 0.09 per magnitude if similar instruments are used.

(2) From the total magnitude a ratio of the magnitude per unit of area can be found for a given observation, thus defining the surface brightness.

(3) More accurate determinations of a comet's absolute magnitude can be derived.

(4) No one observer will be limited to just one instrument for photometric work.

NOTE: Only an instrument equipped with an eyepiece having a large enough field to include all of the object should be used with the photometer. A good measuring scale to use is a field diameter two or three times larger than the entire comet, including the fainter outer portions. Of course, here the observer will have to use discretion.

# THE A. L. P. O. LIBRARY

by

Walter H. Haas

Our Association of Lunar and Planetary Observers is beginning what we hope will turn out to be a valuable service to our members, a library. The Librarian, who is in charge of the books, is:

E. Downey Funck
256 N. E. 11th Street
Delray Beach, Florida.

All requests to borrow books should be addressed to Mr. Funck. We are much indebted to him for taking charge of the embryo library.

The library will be useful, of course, only in so far as it is actually used by our members. The books are there to be borrowed and read, not merely to fill space on shelves. We naturally have hopes that the library will grow and will eventually include many books and magazines of value to lunar and planetary specialists and not available in most city or college libraries. What will happen will depend upon the support and interest of you, our members. Your comments and suggestions about the library are at all times most welcome, including negative criticisms.

A few regulations are necessary. The borrowing of books is limited to A. L. P. O. members and, for the present at least, to A. L. P. O. members in the United States. A book may not be kept on loan for more than 30 days. There will be a charge of 50 cents for each loan, and in addition the borrower must pay the return mailing costs. This fee was selected after a discussion with Mr. Chester Linscheid, the Librarian of New Mexico A. and M. College just outside of Las Cruces.

It is possible that some good friends may wish to give books to the library from time to time. It is requested that such gifts be sent to the writer at A. L. P. O. headquarters for processing, not directly to Mr. Funck.

There follows a list of the books now on hand -- a very modest start, but still a start. Lists of additional books will appear in future issues at suitable intervals.

| TITLE | AUTHOR | PUBLISHER | DATE |
|---|---|---|---|
| Flight Handbook. Fifth Edition | Maurice A. Smith | Philosophical Library | 1955 |
| The Report on Unidentified Flying Objects | Edward J. Ruppelt | Doubleday & Co. | 1956 |
| Ancient Education | William A. Smith | Philosophical Library | 1955 |
| Spinoza. The Road to Inner Freedom | Dagobert D. Runes | Philosophical Lib. | 1957 |
| Science & Modern Life | Sir E. John Russell | Philosophical Lib. | 1955 |
| The Sun | Giorgio Abetti | Macmillan Co. | 1957 |
| The Sun & Its Influence | M. A. Ellison | Macmillan Co. | 1955 |

| TITLE | AUTHOR | PUBLISHER | DATE |
|---|---|---|---|
| Geometrical Optics | L. C. Martin | Philosophical Lib. | 1956 |
| Foundations of Radio | M. G. Scroggie | Philosophical Lib. | 1957 |
| The Planet Venus | Patrick Moore | MacMillan Co. | 1957 |
| Earth Satellites | Patrick Moore | W. W. Norton & Co. | 1956 |
| Earth Satellite | Patrick Moore | Eyre & Spottiswoode | 1955 |
| The Amateur Astronomer | Patrick Moore | W. W. Norton & Co. | 1957 |
| Man & The Winds | E. Aubert deLaRue | Philosophical Lib. | 1955 |
| Essays in Science | Albert Einstein | Philosophical Lib. | 1934 |
| The Elements of Chromatography | T. I. Williams | Philosophical Lib. | 1953 |
| Rutherford-Atom Pioneer | John Rowland | Philosophical Lib. | 1957 |
| Field Book of the Skies | William T. Olcott | G. P. Putnam's Sons | 1954 |
| Climate, Vegetation & Man | Leonard Hadlow | Philosophical Lib. | 1953 |
| Mysteries of Science | John Rowland | Philosophical Lib. | 1957 |
| A Key To The Stars. Third Edition | R. van der R. Woolley | Philosophical Lib. | 1956 |
| Our Neighbour Worlds | V. A. Firsoff | Philosophical Lib. | 1953 |
| Relativity & Reality | E. G. Barter | Philosophical Lib. | 1953 |
| The Origin & History of the Earth | Woodville J. Walker & Robt. Tunstall Walker | Walker Corp. | 1954 |
| Perceptualistic Theory of Knowledge | Peter Fireman | Philosophical Lib. | 1954 |
| Baruch Spinoza & Western Democracy | Joseph Dunner | Philosophical Lib. | 1955 |

The A. L. P. O. Library has been begun with a gift from the wife of one of our most active members, who prefers to remain unknown but to whom we express our deep thanks.

## BOOK REVIEWS

Once Round the Sun. By Ronald Fraser. Price $3.95.
The Macmillan Company, New York. 1958. 160 pages.
Reviewed by Charles A. Haas

The subtitle describes the book as "The Story of the International Geophysical Year". The author will be known to many scientific readers for his work in various fields of science in IGY programs. He is Administrative Secretary of the International Council of Scientific Unions, which has sponsored the IGY of 1957-58. He is thus very well qualified for this subject.

The book is divided into two major parts. Part One deals with subject matter known to us. The chapter headings are The Spinning Earth, Climate and Weather, Currents, Waves and Tides, Patterns in the Outer Atmosphere, and Sunspots and Solar Flares. These topics are treated in an instructive manner. Part Two is called "Towards New Horizons". Here Dr. Fraser shows what we may find in outer space at the present time of scientific investigation. The chapter headings are A Year of Planned Observation, Antarctica, Division of Labour, Rockets and Satellites, and The Summing Up. The author attempts to demonstrate the importance of IGY programs on a worldwide basis.

The book is easy to understand and is recommended. At the present time we are outer-space minded and are at the beginning of a new, scientific age. Are we ready for the future? This book will assist and stimulate thought about what scientists are attempting in outer space.

How To Make A Telescope. By Jean Texereau. Translated from the French by Allen Strickler. With Forewords by Andre Couder and Albert G. Ingalls. Interscience Publishers, Inc., New York, 1957. 208 pages. $3.50.

Reviewed by Alika K. Herring

Like so many well known opticians of the past and present, Jean Texereau began his optical career as an amateur telescope maker, and had acquired a great experience in this field before he graduated into the ranks of the professional optician. This experience was further enhanced by his work at the Optical Laboratory of the Paris Observatory where he gained further skill in the working of large optical surfaces. He did not, however, lose the amateur viewpoint or his sympathies for the struggling mirror maker. It was largely through his influence that the shops of the Paris Observatory were made available to serious amateurs of the area, and many excellent instruments were made there under his expert supervision and direction. Jean Texereau moreover had the great talent of being able to lucidly describe his methods and procedures. He therefore rendered a great service to the European amateur when he compiled and published the original edition of this work. It is very fortunate that this material is now available to the English reader.

It should be frankly stated at the outset that How To Make A Telescope is not a book for the dabbler. It is "meaty", but not so much so as to prevent the beginner from working through it step by step with some assurance of finding his way in the end. For the more advanced worker it presents a deeper challenge; indeed the worker who masters the complete text will find himself very well grounded in the theory of physical optics as applied to telescopics.

Several criticisms of this book as applied to the beginning mirror maker should be expressed. This reviewer feels the close tolerances necessary for good performance in mirrors of $f6$ ratio, or even $f8$, are probably too severe for a first attempt. The worker should perhaps strive instead for a near sphere at a longer focal ratio, for it should be obvious that a poor sphere of $f10$ or thereabouts will give better performance than a poor paraboloid of $f6$ or $f8$. The Foucault test setup advocated is also perhaps too complicated for a first attempt, and the accurate measurement of zones does not necessarily require the use of micrometer screws. The altazimuth mount, while popular in Europe, has not found a wide acceptance among amateurs in this country and is not likely to supersede the more conventional forms of the equatorial mounting.

These criticisms are, however, comparatively minor. This reviewer considers the book to be a valuable addition to the literature on the subject and believes that it will occupy a niche intermediate between Making Your Own Telescope and the Amateur Telescope Making series. It is therefore warmly recommended for the workshelf of every serious amateur.

Der Sternenhimmel 1958. Edited by
Robert A. Naef. Published by H. R. Sauerlaender & Co., Aarau, Switzerland. 126 pages. Available in the United States from Albert J. Phiebig, P. O. Box 352, White Plains, New York.

Reviewed by Walter H. Haas

We are again indebted to the Swiss Astronomical Society and Editor Naef for an excellent annual astronomical handbook, the eighteenth of its kind. It does have the handicap, for many A. L. P. O. members, of being in German. For those conversant with this language there is a wealth of valuable information in this paper-bound booklet, which is sure to make studying the skies more purposeful and more enjoyable. For example, we find on page 26 a map of Mars drawn by Dr. Du Martheray on the basis of personal observations in 1941-52. A key map of the moon on page 108 with almost 100 named formations is definitely useful to the beginner.

The general arrangement follows previous volumes. The early pages explain clearly the use of the handbook and give much general current information about the different planets, the bimonthly star charts, Julian dates, etc. There is then presented for each month a celestial calendar, a description of solar, lunar, and planetary phenomena for that month, a listing of known major meteor showers, any unusual events, and some notes on visible constellations and variable stars. A good selection of illustrations adds much to the interest of the handbook. A list of stellar objects for the telescopist (nebulae, clusters, bright variables, double stars, and brilliant stars) and a $2\frac{1}{2}$ page explanation of some common astronomical terms are in themselves worth the price of the book.

Highly recommended to the German-reading observing amateur.

## SOME UNUSUAL ASTRONOMICAL EVENTS IN 1958

Occultations Of Stars By Juno. Mr. R. A. Wurgel, 634 - 39th Street, Union City, New Jersey has called attention to an appulse between the minor planet Juno and a star of magnitude 8.2 near $21^h\ 50^m$, U.T. on February 19, 1958. We regret very much that this issue has been so delayed in going to press that we cannot pass along this information to our readers in time for them to attempt observations; we apologize to Mr. Wurgel for this failure. However, Mr. Wurgel will still be glad to learn of any observations which may have been carried out and will pass them along to the proper centers. We are very fortunate also in having a possible second opportunity of this kind. On April 4, 1958 at $23^h\ 10^m$, U. T. Juno may occult the star BD+13° 1100, magnitude 9.0, as seen from South America. Juno is then of stellar magnitude 8.8. It should be realized that predictions of occultations of stars by asteroids are subject to much uncertainty, however; and observers should watch the star and planet very attentively for five or ten minutes on each side of the predicted time, and not merely from South America. It is impossible to see Juno as a disc with ordinary telescopes; observers should use small apertures, say around three inches, and should carefully time changes in the brightness of the temporarily merged image of Juno and the star, which would suddenly dim by about half a magnitude if the star was occulted. As Mr. Wurgel says, electrical or photo-electric timing of these events is very desirable, if available. The objective of this investigation is a determination of the diameter of the planet; and for this purpose it is most important that all observations, certainly including negative ones, should be reported, either to Mr. Wurgel or to the Editor.

## Two Occultations of Stars by Saturn & Its Rings

Our source for these data is the 1958 Handbook of the British Astronomical Association.

The first event is scheduled for May 1, 1958; the star is BD-21° 4701, magnitude 8.8 and spectral class A0 (blue).

| Station | Outer Ring U.T. | Outer Ring P. | West Limb U.T. | West Limb P. | East Limb U.T. | East Limb P. | Outer Ring U.T. | Outer Ring P. |
|---|---|---|---|---|---|---|---|---|
| Palomar | $10^h\ 49^m$ | 271° | | | | | | |
| Rarotonga | 10 57 | 270 | $12^h\ 39^m$ | 266° | $15^h\ 21^m$ | 100° | | |
| Wellington | 10 59 | 268 | 12 41 | 264 | 15 27 | 101 | $17^h 12^m$ | 97° |
| Tokyo | | | | | 15 30 | 94 | 17 16 | 94 |
| Perth | | | | | 15 30 | 102 | 17 20 | 96 |
| Hyderabad | | | | | | | 17 24 | 95 |

Since Saturn is in retrograde motion at the time, the star first disappears at the outer edge of Ring A, the outer ring, later isocculted at the west limb of the planet, later still reappears at the east limb, and finally reappears from behind Ring A. P. is the position angle, 0° at north, 90° at east, and 270° at west.

On May 27, 1958, Saturn occults the star -21° 4657, magnitude 9.0.

| Station | Outer Ring U.T. | Outer Ring P. | West Limb U.T. | West Limb P. | East Limb U.T. | East Limb P. | Outer Ring U.T. | Outer Ring P. |
|---|---|---|---|---|---|---|---|---|
| Montreal | $7^h 9^m$ | 253° | $8^h 0^m$ | 233° | $9^h 18^m$ | 132° | | |
| Palomar | 7 14 | 253 | 8 3 | 233 | 9 20 | 133 | $10^h 23^m$ | 110° |
| Rarotonga | 7 28 | 246 | 8 14 | 224 | 9 17 | 141 | 10 20 | 115 |
| Wellington | 7 33 | 242 | 8 16 | 220 | 9 14 | 146 | 10 15 | 116 |
| Sydney | | | | | 9 15 | 146 | 10 16 | 117 |

All observers who can are urged to make an attentive study of at least one of these occultations, both if possible. What are desired are observations of possible brightenings of the stars as they cross divisions in the rings, preferably very accurately timed brightenings, data on the visibility or invisibility of the stars through different parts of Rings A, B, and C, and evidence on any possible optical effects of Ring D, the outer Crape Ring. Readers should refer to "A Coming Occultation of a Star by Saturn and Its Rings" on pages 122-124 of our September-October, 1956 issue. This former occultation did transpire on April 28, 1957 but was rather inadequately observed because of singularly poor luck almost everywhere with clouds, haze, and bad seeing. We here have, through no merit of our own, two opportunities to repeat the investigation; we must do our best now, for these phenomena are rare. Any observations made should be reported promptly either to Mr. Thomas Cragg, the Saturn Recorder, or to the Editor.

## A Possible Occultation of a Star by Pluto

The following is extracted from page 20 of the 1958 H. B. A. A. "It is possible that Pluto will occult the northerly component of the double star ADS 7910 on Nov. 20 [1958] at some time between $21^h$ and $22^h$ [Universal Time]. It is hoped to publish further details later when accurate measurements of position may be available. It is essential that as many observations as possible are secured. When it is realized that Pluto itself need not be (and, in fact, should preferably not be) visible to the observer, it is hoped that all amateurs in Asia with telescopes of 2 inches aperture upwards will attempt the observation and record the duration of the occultation if it occurs. They are requested to send the details of their observation to Gordon E. Taylor, H. M. Nautical Almanac Office, Royal Greenwich Observatory, Herstmonceux Castle, Hailsham, Sussex, England."

The Editor will be glad to relay to Mr. Taylor any observations secured by our members. The components of the double star mentioned are each of magnitude 8.7.

## Occultations of Stars by Mars in 1958

This information is from page 19 of the 1958 H. B. A. A. :

| Date | Star | Station | Disappearance U.T. | | Disappearance P. | Reappearance U.T. | | Reappearance P. |
|---|---|---|---|---|---|---|---|---|
| April 22 | BD-14° 6188 ($8^m.0$) | Perth | $20^h$ | $6^m$ | 95° | $20^h$ | $9^m$ | 228° |
| | | Sydney | 20 | 6 | 93 | 20 | 9 | 230 |
| May 28 | BD-5° 6030 ($9^m.0$) | Rarotonga | 14 | 53 | 354 | 14 | 54 | 320 |
| | | Wellington | 14 | 51 | 45 | 14 | 55 | 271 |
| June 23 | BD +1° 142 ($8^m.7$) | Rarotonga | 16 | 0 | 42 | 16 | 5 | 272 |
| | | Sydney | 15 | 58 | 40 | 16 | 2 | 275 |
| | | Wellington | 15 | 59 | 61 | 16 | 3 | 254 |
| Aug. 25 | BD+15° 450 ($7^m.3$) | Algiers | 3 | 5 | 97 | 3 | 14 | 230 |
| | | Athens | 3 | 8 | 108 | 3 | 16 | 220 |
| | | Greenwich | 3 | 6 | 75 | 3 | 16 | 253 |
| Oct. 26 | BD+19° 624 ($8^m.9$) | Greenwich | 19 | 54 | 265 | 20 | 24 | 95 |
| | | Moscow | 19 | 48 | 258 | 20 | 18 | 102 |
| | | Rome | 19 | 58 | 247 | 20 | 26 | 112 |
| | | Tokyo | 19 | 22 | 225 | 19 | 45 | 135 |
| | | Tomsk | 19 | 37 | 252 | 20 | 6 | 107 |
| | | Tashkent | 19 | 47 | 225 | 20 | 8 | 135 |

These occultations will probably be chiefly interesting to the planetarian as opportunities to search for optical effects of the atmosphere of Mars when a star is very close to the limb of the planet. Both a dimming and a reddening of the light of a star may there be expected. Photo-electric methods of investigation are recommended to persons having the necessary equipment.

Occultations of Planets by the Moon in 1958

Mercury will be occulted on March 21 for observers in North and Central America. Venus will be occulted on June 14 as seen from North America, northern Europe, and northern Asia. Mars will be occulted twice, on August 7 as observed from North America and on September 4 as observed from southeast Asia and Australasia. Jupiter will undergo three occultations by the moon, on August 19 from South America, on September 16 from central Africa, south Asia, and Astralasia, and on October 14 from east and southeast Asia.

Conclusion. The astronomical t reats mentioned above are in part available to each of our A. L. P. O. members, widely scattered as we are over the whole world. We urge everyone to observe whichever ones of these phenomena that he can and then, every bit as important, to report his results. It will be very creditable to our Association if we can secure full and valuable records on each event. By all means let us try.

## A PROGRESS REPORT ON URANUS AND THE ALPO

by

Leonard B. Abbey, Jr.

Since its inception in the Spring of 1956, the Uranus-Neptune Section of the ALPO has received many more observations than was expected. It was thought that this section would be the least popular of all, but we have received more observations than the Mercury Section. This is somewhat surprising since it is much easier to see details on Mercury.

For the period beginning January 1, 1955, reports have been received from the following eleven observers:

| Observer | Location | Instrument | No. Observ. |
|---|---|---|---|
| L. B. Abbey, Jr. | Decatur, Ga. | 6" reflec. | 10 |
| T. A. Cragg | Inglewood, Cal. | 6" refrac. | 2 |
| W. H. Haas | Las Cruces, N.M. | $12\frac{1}{2}$" reflec. | 3 |
| D. D. Meisel | Fairmont, W. Va. | 8" reflec. | 23 |
| Owen C. Ranck | Milton, Penna. | 4" refrac. | 31 |
| S. R. Sinotte | Keokuk, Iowa | 6" reflec. | 1 |
| C. J. Smith | Oakland, Cal. | 6" refrac. | 1 |
| Frank Vaughn | Madison, Wisc. | 10" reflec. | 1 |
| Brian Warner | Sussex, England | 7" reflec. | 1 |
| F. C. Wykes | Kent, England | 6" refrac. | 4 |
| T. Wyngaard | Madison, Wisc. | 10" reflec. | 1 |

A total of 78 observations was received. Owen C. Ranck has been by far the most active observer. His reports have come in regularly during the entire period covered in this report. He has proven that a small aperture is indeed no hindrance to planetary investigation. Figures 4 and 5 are typical of Ranck's observations. Figure 6, by Vaughn, is perhaps representative of the planet's appearance to most observers. No detail at all was recorded with the exception of one suspected shading near the northeastern limb.

There are many questions that must be answered and problems that must be solved before the actual worth of our observations can be determined. The most important question of all is: Can we see markings on Uranus? It is impossible to answer this at the present time. The points considered below may help us someday to solve the problem.

Most of the drawings submitted usually fall into two classes. Both are based on the reasonable assumption that Uranus has cloud belts parallel to its equator as do the closer "Giant" planets. Drawings of the first group show the belts as concentric circles, much as they might be expected to appear when a pole of the planet is near the center of the hemisphere seen from the Earth. Drawings of the second group portray straight belts parallel to a diameter of the disk. This aspect would be expected when a pole is near the limb, as seen by a terrestrial observer. The pole is actually now inclined about $40^{o}$ from the center of the disk. While it is true that it is very hard accurately to determine the shape and position of markings that are on the limit of visibility, most of these drawings must be regarded as representing subjective details. One would suspect that the person making the drawing had preconceived notions as to the inclination of the pole! Whether or not these drawings represent details that are in part objective, they must be regarded as inconclusive because of the subjective distortion which is most certainly present. Another minor point is that most drawings do not show the correct limb shading as predicted by theory. This is perhaps excusable since observers of the nearer "Giant" planets, Jupiter and Saturn, often neglect to draw the limb shading even though it is easily visible. The limb darkening should, however, be the most prominent feature of Uranus' disk.

Several observers seem to have been victims of a rather interesting optical illusion. They have drawn polygons of five or six sides whose vertices do not quite touch the periphery of the disk. Figures 7 and 8 as well as Haas' drawings in Plate XIX of Patrick Moore's A Guide to the Planets illustrate this aspect. Abbey noted the same type of illusion while observing Venus. One half of a seven or eight-sided figure was seen on the bright disk when observed through a 60 mm. refractor. In this case the vertices of the polygon did touch the limb of the planet, but no similar markings were observed on the side of the disk that was bordered by the terminator. Figure 9, drawn from memory, illustrates this appearance. The interior and the edges of the polygon were observed to be shaded. A few minutes later the planet was observed through the 30" Cassegrain reflector of the Bradley Observatory and no markings were seen. Another look through the small refractor proved the markings to be still present in that instrument. Such markings are obviously due to the contrast between the bright planet and the nearby dark sky. The higher power and optical arrangement of the larger instrument gave less contrast than the lower power of the small one. It is strongly suspected that similar markings would be observed on Neptune if it presented a larger and/or brighter disk.

Turning to the proposed magnitude variation study[1], we find a rather hopeless situation. Dr. H. L. Giclas, of the Lowell Observatory, has kindly sent copies of two papers concerning photometric searches for magnitude and color variations of Uranus. To quote Dr. Giclas: "The brightness of Uranus has been observed photoelectrically in three colors on 46 nights during the oppositions of 1950, 1951, and 1952.... The results show that the variation in brightness of Uranus over the whole period observed is restricted to less than 0.01 magnitude. No short-period variation ascribable to rotation of the planet was detected. The difference in mean brightness of Uranus now as compared to the value obtained photoelectrically by Stebbins in 1927 is less than 0.08 magnitude.... "[2]

Since the smallest magnitude variation detectable by visual methods is 0.1 magnitude, there is obviously little hope for the amateur in this field.

All of these problems must be taken into consideration when evaluating our observations. They have been mentioned here so that the observer can see why no definite results have been produced in this field.

The most important project for the immediate future is a coördinated effort on the part of all interested observers to detect detail at the same time. By matching drawings and notes, we could immediately determine whether some markings can be seen or whether they are all subjective. All interested observers are invited to participate. The date and time at which our simultaneous observations are to take place will be announced through the mail to all observers who express an interest. Observers who have already communicated with the section need not do so again; they will automatically be notified.

Neptune is understandably the planet least observed by A. L. P. O. members. D. D. Meisel has contributed 7 observations of this planet. Three drawings made with the 60 cm. refractor of the Pic du Midi Observatory were kindly communicated by Dr. Audouin Dollfus. It should be mentioned that all problems and objections to observations of Uranus apply doubly to Neptune.

References:

1. Leonard Abbey, "The Uranus-Neptune Section Report No. 1: Plans for 1957", The Strolling Astronomer, May-June 1956, p.54.

2. H. L. Giclas, "Photoelectric Magnitudes and Color of Uranus", The Astronomical Journal, April 1954, p. 128.

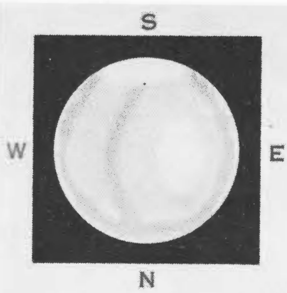


FIGURE 4

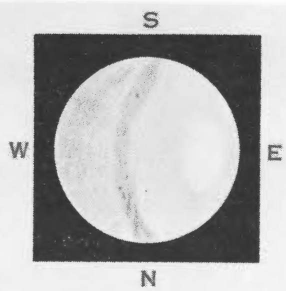


FIGURE 5

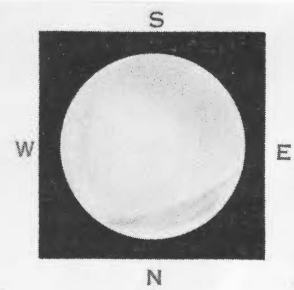


FIGURE 6

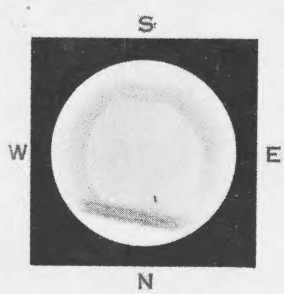


FIGURE 7

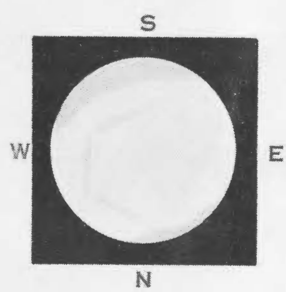


FIGURE 8

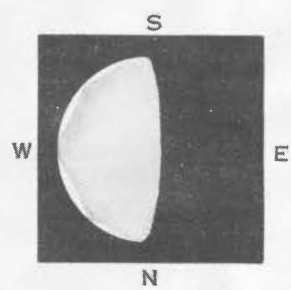


FIGURE 9

Fig. 4. Uranus. O. C. Ranck. March 4, 1957. $2^h 55^m$, U. T. 4-inch refrac. at 180X.

Fig. 5. Uranus. O. C. Ranck. March 24, 1957. $2^h 40^m$, U. T. 4-inch refrac. at 180X.

Fig. 6. Uranus. Frank Vaughn. Jan. 22, 1956. $6^h 10^m$, U. T. 10-inch reflec. at 160X.

Fig. 7. Uranus. W. H. Haas. Jan. 24, 1957. $5^h 15^m$, U. T. 12.5-inch reflec. at 303X.

Fig. 8. Uranus. F. C. Wykes. March 3, 1957. $21^h 0^m$, U. T. 6-inch refrac. at 225X.

Fig. 9. Venus. Sketched from memory by L. B. Abbey. Apparition of 1955-56. 60-mm. refrac. at 75X.

## THE RADIAL BANDS OF ARISTARCHUS

by

Joseph Ashbrook

"It is probable that a suggestion of evolutionary change will arise when the history of Aristarchus, spread over nearly 90 years, is studied, " according to Robert Barker (1). Wilkins and Moore (2) omit these reservations and state flatly, "Barker considers that [the dark radial bands] have definitely increased in visibility during the past fifty years or so. " The evidence Barker advances for this change is that early authors such as Birt, Schmidt, or Neison do not seem to mention the bands, which today are to be seen with small apertures. The earliest record of these markings is, according to Wilkins and Moore, an 1863 drawing by Lord Rosse. Negative evidence, however, is always at the mercy of any positive instance, and this we can find in the writings of Schmidt himself.

On page 258 of the volume of text accompanying his lunar map, he states: "1851 Feb. 15. Aristarchus was drawn at full moon. The white radial streaks begin at the central peak, and (as in Plinius) run outward like the spokes of a wheel to the crater wall. They extend farther through the gray nimbus, and disappear in the dark mare. " (3). There are additional brief mentions of the Aristarchus bands on pages 105 and 106 of the same book, so that their appearance was evidently familiar to Schmidt. In 1851 Schmidt observed the moon almost exclusively with the Bonn Observatory's Fraunhofer refractor of 5 feet focal length, whose aperture was presumably about 4 inches. His description could perhaps serve for an observation made today with corresponding optical means. While Schmidt calls the bands white and present-day observers are used to speaking of them as dark, the difference is of little consequence — are a zebra's stripes dark or light?

Because at least one early observer thus made out the bands of Aristarchus with a small telescope, there is hardly any reason for doubting that they are permanent markings which merely failed to attract widespread attention in early days when few persons were observing the moon systematically. If so, then the Aristarchus bands should not be cited as an instance of progressive change on the moon.


(1) Barker, Robert, J.B.A.A., 58 99-101, 1948.
(2) Wilkins, H.P., and Moore, P.A., "The Moon", page 257.
(3) Schmidt, J. F. J., "Charte der Gebirge des Mondes... Erläuterungsband," 1878, page 258.


## FINAL ANNOUNCEMENTS

Readers are requested to note the change in the address of this periodical. Much confusion will be saved if they will immediately begin to use the new address:

THE STROLLING ASTRONOMER
(THE ASSOCIATION OF LUNAR & PLANETARY OBSERVERS)
1835 EVANS PLACE
LAS CRUCES, NEW MEXICO

This change is effective at once. It results from the Editor's move to a different house.

The Third A. L. P. O. Convention, in 1958, will consist of two parts, one with the Astronomical League at Ithaca, New York at the beginning of July and one with the Western Amateur Astronomers at Pasadena, California in mid-August. More details will be given in our next issue.

We are much indebted to Mr. E. P. Martz, Jr. the leader of the Holloman-Alamogordo, New Mexico Apogee Moonwatch Station for this issue's front cover photograph. We congratulate Mr. Grubb most heartily on making the first optical sighting of the first U.S. artificial satellite.

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