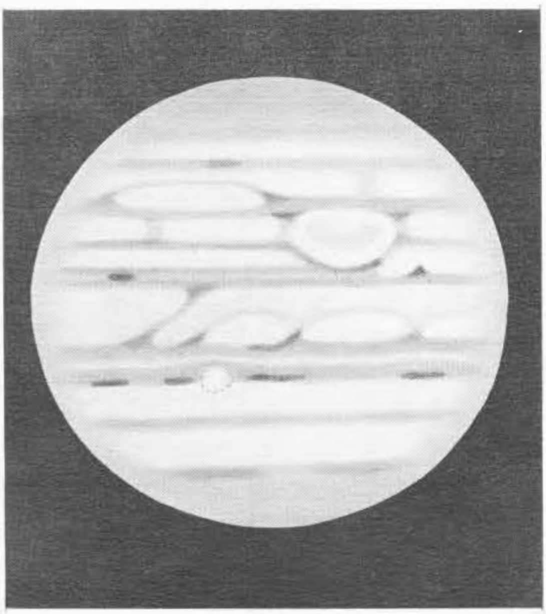
The Journal Of
The Association Of Lunar
And Planetary Observers

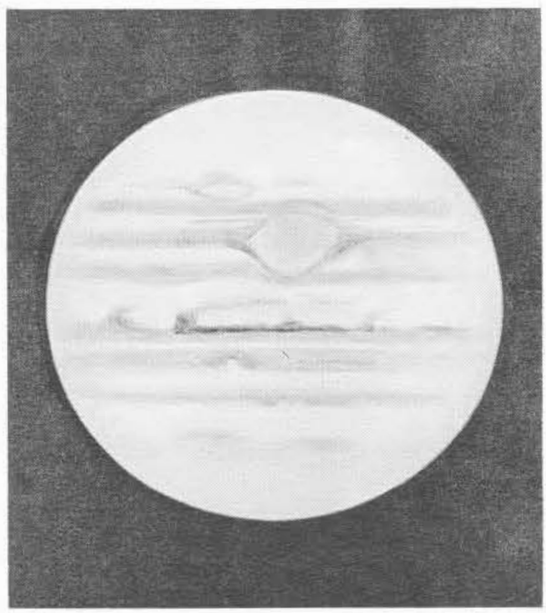
The Strolling Astronomer

Twentieth Anniversary Issue

Volume 20, Numbers 7 - 8

July - August, 1966
Published September, 1967





The Giant Planet Jupiter in 1947, the year of the founding of the A.L.P.O., and in the present year. Left drawing by Elmer J. Reese on June 10, 1947 at 4 hrs., 25 mins., Universal Time with a 6-inch reflector at 240X, fair seeing and good transparency. C.M. = 271° in System I and 210° in System II. Red Spot and Hollow a little right of the C.M. Right drawing by Stanley M. Shartle on April 2, 1967 at 1 hr., 45 mins., U.T. with a 12.5-inch Cassegrain at 596X, fairly good seeing and good transparency. C.M. = 210° by System I and 20° by System II. Red Spot near C.M.

THE STROLLING ASTRONOMER
Box AZ
University Park, New Mexico
88001

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

ASSOCIATION OF LUNAR & PLANETARY OBSERVERS
ALPO

Founded In 1947

IN THIS ISSUE

TWENTY YEARS OF THE A.L.P.O., AN APPRECIATION

By: James C. Bartlett, Jr.

In these our stirring times, with a Surveyor digging up the Oceanus Procellarum and an Orbiter blandly photographing the backside of the moon, all at the taxpayers' expense, the amateur astronomer with his modest equipment and even more modest financing is assailed by alarms. What, indeed, is his future - if any?

Let him take courage. What is happening today is merely a repetition, albeit in a different way, of what has happened many times in the history of science; and while all must recognize that an era has come to an end, it is also true that an era is opening, and one the potentialities of which not even a computer can predict.

Let him reflect, too, that when the A.L.P.O. made its debut in this best of all possible worlds, twenty odd years ago, nothing was any different. True, the private investigator did not have to compete with multimillion dollar NASA projects, moon rockets, and computers smarter even than the men who built them; but he had to pit his average 8-inch reflector against the 200-inch Palomar giant, then approaching completion, and his projects then as now were hampered by lack of funds and by simple instrumentation. Nothing has changed but the scenery; the play is the same. In these circumstances the founding of the A.L.P.O. by Walter H. Haas and a handful of dedicated associates was an act of faith, the faith that despite the overwhelming advantages conferred on others by ample means and imposing matériel, there was still opportunity for the individual thinker and researcher. Was such faith justified or even realistic? I hold that it was, and that it still is.

Let the skeptic remember that Newton demolished theories of "homogeneal" light, going back to antiquity, with nothing more substantial than a piece of paper, a hole in a curtain, and a novelty picked up at a county fair. Moreover, a dear friend of mine, now long since passed to Nirvana, became a recognized authority on the movements of asteroids; his equipment was a pillar-and-claw stand refractor of 2 inches aperture, which he mounted on his windowsill. Of course, if we try to imitate the work of great foundations, the results will be laughable; but if we contribute independent thinking to matters within our ken, the results at any time may be incalculable. In fine, there never was and never will be a time when individual effort becomes valueless.

The great contribution which the A.L.P.O. has made to independent scholarship has been to provide a congenial home where students of divers interests have, for the past twenty years, been able to exchange information, ferment theories, belabor same, and keep abreast of the times. In doing so, and almost incidentally, a vast amount of observational data has been accumulated in which unsuspected nuggets may well await the researcher; moreover, such data are often what the professional worker would like to have at some given moment, and which he is not likely to find anywhere else.

The A.L.P.O., therefore, has provided not only a pleasant laboratory in which the ferment of ideas can proceed unhindered, but also a forum in which the brew can be tested; and those of us who have enjoyed the amenities of The Strolling Astronomer may not always have appreciated the contribution which this journal has made to freedom of expression. The notion that subject matter submitted to professional journals is always judged strictly on merit is pure delusion. Not only does editorial bias play a large part, but there is a growing tendency to exercise partisan censorship over the contributors. The recent, humiliating experience of a distinguished American astrophysicist is a shining example. This savant, of unquestionable professional standing, suffered the novel experience of having a letter rejected by a prominent journal, not because it had no substance, but because it dealt with matters considered taboo by the Editors.

In The Strolling Astronomer we have enjoyed a medium through which many novel, not to say unorthodox, concepts have been freely explored, a medium in which room is found for the historical and the philosophical no less than for the theoretical and the technical, for the worker whose interest is in generalizations, as well as for the worker whose passion is for specifics expressed in graphs, curves, and incomprehensible equations. May its guiding principle never change!

In yet another direction the A.L.P.O. has rendered a signal service to amateur astronomical research, by bringing a new dignity to the concept itself. Too many Americans, it is to be feared, shy away from the word "amateur" in the mistaken belief that it is vaguely derogatory. They should be proud rather of the company they keep. Let them remember Sir William Herschel, the "Father of Modern Astronomy", Neison, Elger, Goodacre - amateurs all.

The winds of change are blowing strongly, and until the dust settles it is impossible to see clearly what contributions the A.L.P.O. will make in the future, what lines of research will be open to us. But that there is a future, and that we still have work to do, is not to be doubted. Therefore, while saluting the past let us prepare for the future, always remembering that it is thought, not gadgetry, which makes man what he is, superior not only to other animals but mayhap even to computers.

Finally, one must notice an A.L.P.O. contribution of no mean order. I refer to the opportunity of congenial fellowship afforded by the Association, where room is found for even such gloomy misanthropes as myself. For this, as for many other benefits, we are all indebted to the selfless labors of Walter Haas and the dedication of a willing staff. Nor must we forget that it has been the peculiar genius of Prof. Haas to preserve in the A.L.P.O. a fast-vanishing flavor of happier times.

REFLECTIONS ON AMATEUR LUNAR AND PLANETARY OBSERVATIONAL ASTRONOMY AND THE ROLE OF THE A.L.P.O.

By: Joel W. Goodman

Modern observational astronomy had its origins during the millenia that preceded the invention of the telescope. During the span of those imperfectly known ages, the movements of the sun, the moon, and the planets were charted with respectable accuracy, even by contemporary standards. With the introduction of the telescope in the seventeenth century, man could explore these neighboring bodies with greater intimacy; and his fund of knowledge grew with advances in technology. Rapid strides were made, due largely to the efforts of devoted amateurs like the Herschels, Schröter, and a myriad of others too numerous to name.

In the twentieth century, improvements in communication made possible organized groups of amateur astronomers; the most active in the lunar and planetary field have been the British Astronomical Association and the Association of Lunar and Planetary Observers. Using telescopes ranging for the most part from 3 to 12 inches in aperture, these amateurs have maintained a systematic surveillance of the moon and the planets for over half a century. In the United States, amateur observational astronomy was catalyzed during the 1950's by the appearance of commercially fabricated reflecting telescopes of adequate aperture and high quality at modest prices.

This development paralleled a dramatic growth of the ALPO, which was founded in 1947 as a means of maintaining contact and dispersing information and ideas among a small group of ardent observers who had been communicating with one another and occasionally with European colleagues in a more or less sporadic fashion for a number of years. World War II slowed these exchanges, but the tempo quickened after its close. The need to communicate became sufficiently intense to warrant a modest news bulletin. Thus, in March of 1947, Walter H. Haas sired the Association of Lunar and Planetary Observers and its organ, _The Strolling Astronomer_.

The ALPO today bears little resemblance to its modest postwar beginnings. It has weathered the growing pains of childhood and adolescence and has matured into a healthy young society. The journal has increased severalfold in size and sophistication. Illustrations were incorporated into its format for the first time in 1950, and _The Strolling Astronomer_ has never looked back. Growth in numbers has been accompanied by the availability of better and more diverse equipment, and new observational techniques have been introduced to approach special problems. The "Moon-Blink" program is one case in point. These changes were, of course, to the good; but the underlying philosophy that ties ALPOers into a closely knit fraternity remains unchanged. It is an abiding interest in the moon and planets and the pure and simple pleasure of observing them with one's own telescope. Garrett P. Serviss captured the essence of this idea in the opening statement of his book, _Pleasures of the Telescope_: "If the pure and elevated pleasure to be derived from the possession and use of a good telescope of three, four, five, or six inches aperture were generally known, I am certain that no instrument of science would be more commonly found in the homes of intelligent people."

I became involved in ALPO activities in 1952, and the Association rapidly crystallized my thoughts and channeled my efforts in lunar and planetary astronomy. The enjoyment derived from visual observing multiplied with developing skills and their directional application. This is without question the major tangible service provided by ALPO for the novice. It can be, and indeed has been, instrumental in the maturation of young scientists. I know that it has been an integral part of my own growth process.

The question might well be asked: what have the efforts of these scores of amateur observers directly contributed to the science of lunar and planetary astronomy? Basically, their contribution consists of a large body of descriptive information which will someday be reconciled with underlying physical processes, when these become unravelled. It is unfortunately true that the amateur is seldom equipped, either by training or with instruments used, to undertake mechanistic problems. The Great Red Spot of Jupiter is a characteristic example. It has been followed more or less assiduously since the mid-nineteenth century through changes in intensity, morphology, alignment, and position. Yet we know little more today about what it is, how it came to be, and why it behaves as it does than we did on the day it was discovered. True, professional astronomers have made no more headway with the Red Spot than have amateurs. Still, it might be safely predicted that when the answers are forthcoming, professionals will provide them.

Can it be concluded, then, that the amateur is poorly rewarded for his efforts? If the yardstick we apply is the significance of his scientific contributions, then the answer must, in a sense, be yes. But the chase is often more rewarding than the kill. The primary motivation of the amateur is not, and never has been, his opportunity to contribute to science. The modest contributions he can make are all to the good; but his clarion call is the pure pleasure to be derived from studying the moon and planets at first hand, and from the excitement of the realization that they are largely unknown, mysterious worlds, the next frontier of man's exploration.

If the excitement of the unknown is indeed a major attraction to the amateur, will the lunar and planetary exploration programs of today and the years to come relegate his telescope to a forgotten corner of the basement or attic? Admittedly, much of the spice to be derived from viewing a small, imperfect telescopic image of Mars to catch elusive glimpses of polar caps and maria will be lost when the surface of that planet has been exhaustively charted by orbiting satellites. Indeed, some of the air has already been let out of the balloon by Mariner IV. However, the amateur does not disdain his 6-inch telescope simply because he and others have had more detailed views with much larger instruments. The value of self-experience cannot be undersold. And the simple aesthetic satisfaction of observational astronomy will never be extinguished. I confidently trust that twenty years from hence we shall be celebrating the fortieth anniversary of an older and mellower ALPO.

LUNAR AND PLANETARY RESEARCH, THE AMATEUR ROLE

By: Charles L. Ricker, A.L.P.O. Lunar Recorder

The publication of this Twentieth Anniversary Issue of The Strolling Astronomer is a joyous occasion! It marks twenty years and thousands of observations by amateur observers from all states and from many countries. It also marks twenty years of devoted and selfless effort by our Director, Walter H. Haas, without whose untiring dedication there would be no A.L.P.O. or Strolling Astronomer. The fact that both still exist is testimony also to the undiminishing interest and fascination which we all feel toward the moon and planets.

Amateurs of yesterday were not very different from those of today. As a rule, they were drawn into the A.L.P.O. when they realized that they could compare their observations with those of their fellows, and perhaps, after attaining the necessary degree of skill, could see their observations published along with those of other accomplished observers. Who among us can forget the pleasant feeling of satisfaction when we saw our first observation in print? Then, of course, there was always the satisfaction that perhaps a useful contribution to scientific knowledge was being derived from the observations and from publication thereof.

A careful study of our Fifteenth Anniversary Issue will prove interesting and instructive. In that issue there were several articles concerning the role of the amateur in present day astronomy. The interesting point is that these articles could have been written for this present issue, and still be current. In these past five years, much has been accomplished in Solar System research. The Ranger, Surveyer, and Orbiter lunar probes and the resulting beautiful close-up photographs of the lunar surface have all taken place during this period. Similarly, the Venus and Mars probes have proved successful and have provided some very useful and surprising data. Advances in earth-based astronomy have also been startling during this period. Image-Orthicon photography and new techniques for Ultra-Violet and Infra-Red photography have been just a few of the advances. Now if one were to consider these facts only, he could well come to the conclusion that amateur lunar and planetary studies have become as obsolete as dinosaurs! A review of the actual situation will show how wrong this is! Again comparing the Fifteenth Anniversary Issue with the present state of affairs, we find that the Lunar Section was at that time without any specific programs; and about all that was being accomplished was the criticism of amateur lunar studies. The situation today is somewhat different! There are three programs of acknowledged usefulness underway, in addition to the Lunar Training Program which had just been instigated five years ago; and the only reason that there are not more active programs is lack of time on the part of the Recorders, and lack of observer response. The planetary programs are enjoying similar success and response. It may seem very strange to some of our critics that the observing Sections of our Association are so vital and active today in the face of the fantastic advances in the space sciences. Actually, instead of being strange, it has been inevitable if one considers the old axiom of science that every new advance and every solution to old problems creates new problems, and enlarges the scope for new advances. It is true that many of the classic problems of astronomy have been solved; but many have not, and many new problems have taken the place of the old ones.

There has never been in the history of the A.L.P.O. a greater scope for amateur studies, or more of a crying need for them. We can listen to the dire predictions of obsolescence and "hang up" our telescopes, or turn to other fields; or we can respond to the actual situation and join in this very exciting phase of lunar and planetary research.

How can we best join these efforts? It is this writer's opinion that we can best do our part by the patient accumulation of observations as we have done in the past. This, plus intelligent reporting of these observations by the observer and critical analysis by the Recorders, will yield final reports in this periodical which will contribute as much or more to lunar and planetary astronomy than ever before.

Of course, we should constantly try to improve our techniques and methods, but hasn't this always been true? Haven't observers responded to the plea for more C.M. transit timings when observing Jupiter? Don't most observers now make intensity estimates of the features of Saturn? Undoubtedly there will be articles in this issue which will present the bleak outlook that in order for amateurs to make a significant contribution, we must be prepared to use instrumentation and techniques which are normally beyond the means and training of the average amateur. Certainly those members who are equipped to undertake these sophisticated studies should be encouraged to do so, but the implication should not be made that classic visual studies are no longer useful!

Whatever the A.L.P.O. has accomplished in the past twenty years has been due largely to those dedicated amateurs who have used nothing more than their telescope and their skill and intelligence. If this type of recording of systematic observations continues, there is little doubt that we shall celebrate the 30th anniversary of the A.L.P.O.

A PERSONAL LOOK AT THE A.L.P.O. WITH SOME MODEST SUGGESTIONS

By: Clark R. Chapman, A.L.P.O. Lunar Training Program Recorder

I am honored to be asked to contribute an article for this anniversary issue. In view of the Editor's request that the article be "to some degree historical and philosophical rather than merely technical", I am taking the opportunity to present informally some of my thoughts concerning amateur lunar and planetary work in general and the ALPO in particular. Having recently completed my co-editorial work on the ALPO Observing Manual, which currently is in the hands of potential publishers, I can reflect on the whole range of lunar and planetary research with which the manual is concerned and on my many discussions with other amateurs and professionals which led to developing the framework for the manual.

It is for our Founder and Editor to state officially what he feels are the principal goals of the ALPO and its _raison d'être_. But by the very organization of the Association into Observing Sections and the devotion of this _Journal_ to publishing semi-regular reports on the observations of members, I think it is clear what the chief ostensible aim of the organization is: to organize systematic programs of observation of the moon, planets, and comets; to collect and synthesize all the observations and perform limited reduction and interpretation of them; and to publish the results for possible eventual use by the scientific community. The ALPO is, of course, different things to different members; some members are probably interested in the Association for reasons quite removed from its ostensible purpose of organizing, analysing, and publishing telescopic observations. Some are "armchair" astronomers with a general interest in the planets; others chiefly enjoy traveling to conventions and meeting different people; and others simply feel that it is fun to draw pretty pictures of lunar craters, quite apart from what the Lunar Recorders or the scientific community can possibly derive from the observations.

But despite these and many other reasons which certain members have for joining, my experience as Lunar Training Program Recorder makes it clear that most of the active members (as distinguished from those who are just subscribers) earnestly wish to pursue their hobby in a serious manner such that they may be able to contribute scientifically useful observations. However, in spite of high aspirations, few observers have the initiative, enthusiastic interest, and abundance of free nocturnal time to make more than token efforts at the systematic observing programs which are required for obtaining data of scientific value. Therefore, it is frequently the case that while dozens of observers may be listed in an observing report, usually 90% of the useful observations come from a mere handful of workers--perhaps only one or two. It appears to me that one of the chief future goals of the ALPO should be to encourage more of the members to embark upon serious systematic observational programs and to show those who do not have so much time how to use their limited time usefully and efficiently in order to produce the most valuable observations.

I have also thought that by showing amateurs where amateur research stands in the wider world of professional lunar and planetary research, observers would be encouraged to realize the importance of the contributions they can make and also to realize what kinds of observations are of greatest value. Although I may be incorrectly attributing my own motivation to others who do not share it, I suspect that most beginners are as interested as I was when I began, not only to learn for themselves about the planets but to try to make what new discoveries they can with their backyard telescopes. The more one realizes what has already been done with other astrophysical techniques and the more one learns what the crucial research problems are on which amateurs can work, the more one is inspired to undertake his own observing program. I started off, as many youngsters still do, on introductory books by a well-known British writer. At the time they opened a new world for me and provided elementary instructions on how to make my own observations. It was only much later, when I eventually became aware of the professional world of planetary research, that I realized that the elementary books are mostly removed from the real world. The make-believe world in which they are shut off is a left-over descendant of techniques and observing programs which were useful many decades ago, but many of which are now outmoded. It was our wish to provide a fresh modern approach to amateur research that guided our preparation of the Observing Manual.

In doing this, Dale Cruikshank and I have occasionally been told that by trying to provide complete, rigorous descriptions of useful observing programs, we are "taking all the fun out of amateur astronomy". This is a distressing criticism--and fortunately a very infrequent one--and one which I don't believe holds for most ALPO members who are happiest and proudest in pursuing their hobby well and usefully. To me the planet Mercury is all the more fascinating because the unsolved problem of the exact period of its rotation and its surface markings is one which a perseverant amateur, willing to face up to the challenge of overcoming the practical difficulties of observing Mercury, has a better chance of solving than anyone else. Why should we believe a well-known British amateur authority when he suggests that apertures in excess of 18 inches are required for useful work, particularly when both theoretical analysis and practical experience suggest that smaller telescopes are equally useful? Of course, if one expects to see anything, he must be more careful than to set up his dusty telescope in the direct sunlight and put in the first available eyepiece. To determine the optimum methods for maximizing both resolution and contrast perception, a little forethought and perhaps even a bit of simple arithmetic used in conjunction with tables in the forthcoming Observing Manual are required; but that appears a small price to pay for the reward of helping to construct the first accurate map of Mercury's surface ever made.

If observations are to have value (or any use at all) they must be made carefully; the observer must be trained and have some experience; he must be familiar with the psychological pitfalls and systematic biases to which he is prone; he must use suitable filters and magnifications; he must record accurately the time, the transparency (faintest star visible to the normal eye), and the seeing (an objective measure of the effective resolution); and he must report the observations clearly, completely, and systematically. So long as these "musts" remain abstractions, they may look foreboding; but really it is very easy to learn the correct procedures, and the observer who does learn them will see much more than he has ever seen before and will learn much more for both science and for himself about the planets.

A few days ago I was invited by a dedicated and enthusiastic amateur astronomer to join him in spending the night looking for some predicted shadow transits of the satellites of Uranus with a large telescope to which he had access. I admit that such an observation would be interesting, and I might even have accepted his invitation had the weather been clear (which it was not and rarely is around New England); but I can think of few planetary observations which would be of less value. Surely with Mars just a few weeks past opposition, a 60-inch telescope would be much more profitably used on Mars were the seeing so superb as to offer the slightest chance of detecting a Uranian satellite shadow. At that resolution, the problem of the existence of the canals could have been solved beyond dispute: and even more important data could have been obtained with a little planning and a few accessories. Perhaps I should commend my friend for his willingness to observe at all; most of the time such large telescopes are left idle when scattered clouds prevent the scheduled photographic or photometric programs. Maybe I'll even be proven wrong when someone discovers that the satellite shadows are huge, proving that the satellites reflect like ball bearings and have the density of cotton. And I'm the last person to want to dictate what someone else must do with his time and telescope. I just want to illustrate the fact that many amateurs still lack a perspective on the usefulness of projects. If these people are given the necessary information (included in our manual), the encouragement of the Section Recorders, and the published examples of some of our current advanced members, I think that the value of ALPO work would increase immensely.

I surely hope so. There is still much which the amateur can do well and fairly simply with his backyard telescope which would help answer some of the current problems of planetary research. Amateurs have the ability to make systematic records of the changing characteristics of planetary surface features, observed with resolution only rarely obtained by professional photography, which supplement decades of previous observations. This is practically the only source of information on long-term planetary phenomena, so important in understanding such things as seasonal phenomena on Mars, cycles of atmospheric activity on Jupiter, and so on.

Once we have many of our observers making useful, systematic observations, the next step is reducing them. Here we encounter a major problem: a shortage of qualified people able to handle adequately Observing Section affairs. Some of our knowledgeable and potentially excellent Recorders have trouble finding the time to correspond with members, let alone perform adequate reductions of the material received. And it is unfortunately the case that material never published in observing reports is usually lost forever from the scientific record. It is essential that all possible information of value be extracted from the observations and arranged in usable order. That is why it is important that Recorders have a thorough understanding of both statistical reduction methods and of the nature of the professional studies for which the amateur studies may possibly be useful. Unfortunately, a few of the enthusiastic, devoted members who have the time and devotion to accept Recorderships lack this fundamental knowledge, through no fault of their own, and are unable to produce really useful reports. All of this somewhat sad state of affairs is the necessary result, of course, of the amateur nature of the ALPO; all work by Recorders is on their own time, which they donate unselfishly to their hobby for no pay and for which they get rather little appreciation. One solution, which appears quite possible to me, is to apply for a grant partially to reimburse some of the busier Recorders. Not only will the Recorders then be able to devote sufficient time to preparing reports, but some of our most informed members may be more strongly attracted to the Recorderships. Surely the potential value of ALPO observational work merits a substantial grant. Perhaps incorporation of the ALPO would make it easier to apply for a grant.

Ideally, Recorders would make thorough reductions of the observations, carefully weighting drawings for the effects of seeing, transparency, telescope aperture, and so on. The observer rating system I proposed in an article several years ago could be empolyed to be sure that all observations used were made by observers who had successfully passed a period of training, or otherwise demonstrated their reliability. Statistical correction for systematic errors and utilization of psychophysical tests of the observers' eyesight could be employed to yield the best possible results. As it is now, some observing reports appear to be little more than casual descriptive summaries of the appearance of the planet in question, perhaps accompanied by more rigorous reduction of only one kind of observation (e.g., central meridian transits). Such inadequate reports and the retiring of many excellent Recorders are mainly due to the excessive effort and donated time required. Let us try to alleviate this problem soon.

The last step in the chain is publication of the results. Clearly, the major purpose of The Strolling Astronomer is to publish the scientific results of ALPO observing programs. Of this fact I am sure our Editor is well aware, and it is hardly his fault that so few adequate Section Reports are arriving at his office. Therefore, some of the more secondary roles of our Journal occupy more pages: articles on research projects of individual members, articles on the methods and goals of amateur research, announcements and planetary prospects for the month, indices, book reviews, preliminary reports, requests for observations, and so on. Nevertheless, we can be proud that our Section Reports (somewhat irregular though some of them are) are currently the most useful such reports published by any group of observers in the world. Although some of the observing programs carried out by the ALPO have little obvious scientific application at this time (and merely provide historical continuity with earlier similar observations which may eventually be found to be important), others are, or can be, of considerable importance to professional astronomers in their current work. It is very important, therefore, that our results be reported in a way which can be most useful to the professional; also it is important that scientists be made aware of the existence of amateur studies and that they be convinced of the reliability of amateur work so that they can use it with confidence.

We are meeting with only limited success in this last step of getting our work accepted into the scientific literature. Of course, The Strolling Astronomer is read (really read) by almost no professional astronomers. In this respect, we are no different from many of the more prestigious technical journals--nobody has the time to wade through even a small fraction of the relevant journals published. Still, it is unfortunate that so few professional astronomers are even aware of the existence of The Strolling Astronomer or of the kind of material which is published in it. And though a few astronomers do respect our work and have used it, there are a few others who know of the ALPO and laugh at it. This is surely a disappointing situation, and it may well irk many dedicated amateurs who are doing excellent observational work and are familiar with numerous examples of errors and poor judgement by professionals. But we must realize that The Strolling Astronomer presents an image rather different from that of the respected technical journals. In the reserve library at Harvard College Observatory, The Strolling Astronomer is placed on a side shelf along with such other non-technical "fun" publications as Stern und Weltraum, Popular Astronomy, and Physics Today, rather than on the shelves with The Astrophysical Journal and The Journal of Geophysical Research. Of course, some other publications are placed directly in the stacks and remain even more obscure.

I believe that much of the work reported in The Strolling Astronomer deserves more respect and wider use. I feel that a number of superficial changes in the Journal and in its operation could do us more justice. That is why I was in favor some time ago of adopting the name "Journal of the Association of Lunar and Planetary Observers". I suspect that The Journal of the Royal Astronomical Society of Canada might not rate the technical shelf at Harvard (as it does) if it were called "The Canadian Stargazer". Changing from the sentimental favorite "Strolling Astronomer" to "J.A.L.P.O." may appear meaningless to us insofar as the product is the same, but public relations evidently convinced U. S. Rubber to change to "Uniroyal".

A second, and perhaps more important change, would be the institution of a rigorous system of refereeing of articles to be published. First, such a system is essential to insuring high technical quality of published articles; such uniform high quality is necessary if the Journal is to command respect. Secondly, it renders objective and impersonal the decision to accept or reject an article, removing the awkward personal involvement of the Editor. Lastly, no single man is sufficiently informed on all subjects to judge by himself the technical quality of all articles submitted. Recognizing these facts, our Editor already makes it an informal policy to send out many, if not most, of the articles he receives to referees before publishing them. That is why to make it a formal policy, explained in each issue on the inside back cover, would be largely a superficial change. It is a change, however, which establishes a public commitment to this necessary editorial procedure, which can only encourage us to improve upon the quality of our published articles.

Very recently I heard a lecture given to an audience of scientists by a visiting geophysicist of international stature. At one point in his talk, while he was discussing models of the dynamics of the interior of Jupiter, he showed a series of slides presenting the results of decades of work by amateur astronomers on the rotation periods of Jupiter's currents and the Red Spot. ALPO Jupiter observers may already know that recent theories suggest that the Red Spot's variable rotation period may reflect a varying rotation period for Jupiter's solid mantle. (Angular momentum could be conserved by opposite changes in the rotation of Jupiter's core, as changes in the radio rotation period may show.) Anyway, the speaker prefaced his description of the slides with a few remarks about amateur astronomers. He noted that in the past, few respectable astronomers would look at amateur data. But, he continued, amateurs deserve much credit for providing this valuable information about Jupiter. Then he expressed his hope that amateurs would continue to collect such data; in another ten years it could yield definitive proof for or against the current model when used in conjunction with radio observations. I think that this trend toward greater appreciation of, and increased use of, amateur data by professionals is a very good one, both for science in general and for amateur astronomy. But we must not be careless, or this tenuous trend may reverse.

I owe much to the ALPO, and to Walter Haas in particular. My early experiences in the ALPO and friendships begun at conventions and through correspondence with other members were very important in starting me on my chosen career in the field of planetary astronomy. I have derived much satisfaction from working on ALPO observing programs and from co-editing the Observing Manual. It is because I value the ALPO and am aware of the great value of much ALPO work, which deserves greater recognition, that I offer the constructive criticisms and suggestions above. I hope that they will be taken in the spirit given. Since they reflect my own personal views and prejudices, I anticipate others will disagree in part (I hope not in whole!). In any case, I would like to hear your considered reactions to my suggestions, and I know the Editor would be interested too. If we get a dialogue started concerning ALPO goals and plans, followed by some concrete action, we can be assured of a continuing growth and improvement during the next twenty years even more impressive than in our first twenty years. Also, I hope that the imminent publication of the Observing Manual will lay the cornerstone for future ALPO observing programs. In closing, I should like to nominate our very hard-working and dedicated Editor as the recipient of at least two-thirds of our first financial grant!

THE ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS, 1947-1967

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

In March, 1947 our Association was founded with the mailing of the first issue of this journal, The Strolling Astronomer, to some dozens of amateur lunar and planetary observers, many of them already correspondents of the writer. It is perhaps too typical that we are some months late in marking this event, and we must thank our friends on the Sky and Telescope staff for their prompt remembrance. Yet it still appears fitting to engage in some historical and philosophical speculations as we complete our second decade and to pause to try to evaluate the role of the amateur student of the moon and the planets and of the A.L.P.O. in contemporary science. For this purpose several requested articles by different colleagues appear in this issue. If these express some widely divergent points of view and opinions, it is good that our Association is able to accommodate and perhaps even to encourage the development of, such varieties in thought.

The progress of lunar and planetary astronomy during the last 20 years has been indeed remarkable. Let us remember that in 1947 a fair amount of the literature upon the moon was still exploring minor facets of the lengthy meteoritic vs. volcanic controversy. The rotation of Venus was assumed to be 30 days as an unconvincing compromise among different kinds of evidence. Few honest astronomers will say that they then expected to find craters in close-up views of Mars, or that they then expected any close-up views of Mars in the twentieth century, for that matter. There were certainly extremely few professional astronomers willing to consider the possibility of any kind of surface changes on the moon--a curious contrast to the present proliferation of government-subsidized programs searching for "lunar transient phenomena." In 1947 no one had any satisfactory theory of the nature of the Great Red Spot of Jupiter, nor does anyone in 1967.

In these advances the A.L.P.O. has played directly only a minor role. Yet indirectly we may have done more in encouraging a keener interest in astronomy and in stimulating active young A.L.P.O. members, a modest number of whom now hold earned Ph.D. Degrees in Astronomy. It is a very proper function for us to provide guidance and challenging projects for these young colleagues. It is also proper to accrue observations which will allow historical continuity with the work of the past. We may have space probes in permanent orbits around Jupiter by 1980, but we shall still long be dependent upon traditional observations for information about possible lengthy cycles of variation sometimes reported on that planet. Yet perhaps the chief goal of the A.L.P.O. should continue to be what it has been in the past, namely, the accumulation of systematic observations on projects suitable for the equipment and abilities of amateurs, with increased efforts to improve the quality of such data and to analyze our results more adequately and more quantitatively. The writer would expect in the future a greater number of observational projects with specific goals and with planned limited periods of duration. A meaningful use of large computers on some of our lunar and planetary problems is a foregone conclusion.

It has been instructive to observe the concern in recent years about the "use" and "value" of their astronomical observations on the part of young amateurs training to become professional scientists. An increased capacity for mature self-criticism is a good thing. Yet "use" and "value" are philosophical terms and have meaning only within some known context. Heinrich Schwabe would scarcely have discovered the periodicity of sunspots if he had asked the opinion of contemporary professional astronomers about the "use" and "value" of his incredibly intensive study of the sun, for all of those gentlemen knew quite well that the occurrence of sunspots was a completely random matter. It is not my intention to say here that the amateur should not regard the community scientific opinion at a given time; on the contrary, our work must be more meaningful in proportion to our knowledge of the subject we are studying, of past contributions to the development of the subject, and of interpretations advanced by the minds of the past and the present. It is definitely my intention to say that an amateur should develop and value his independence of thought.

The major present problems of the A.L.P.O. and their possible solutions must concern us all. Perhaps the wirter as founder and Director might share some of his thoughts.

A serious problem is that of choosing Recorders who are at once knowledgeable, active in their jobs, and prompt with Section Reports of worthy quality. I do not want to appear critical of our staff members, past and present; certainly all who have so served us have contributed to the development of the Association; certainly all have given of their time and money without recompense. Yet it is unsatisfactory when Recorders lose quantities of observational records; it is unsatisfactory when Recorders write few or no Section Reports; it is unsatisfactory when Recorders ignore correspondence. All these things have happened. Experience would suggest that Recorders should normally be mature men, for enthusiastic and energetic young men often enough find other interests after a time. Experience would also suggest that Recorders should ordinarily not be professional astronomers, or young men about to enter this profession; loyalty to one's employer and proper concern with personal career advancement are likely to leave A.L.P.O. work a poor second or third. It is no easy matter to do a good job as a Recorder after working all day at something else, and all of us can help a little by encouraging our Recorders in our correspondence with them and by expressing our appreciation of their voluntary efforts.

The writer would be the first to admit, or rather insist, that his own performance as Director and Editor is often poor. As with the Recorders, it is hard to see how this situation can improve much with available time and strength.

A major problem is a widespread attitude among amateurs that space missions will soon solve all lunar and planetary problems, leaving nothing for the earth-based telescopic observer with modest equipment. Others have dealt with this concept in this issue, and I shall not try to add anything here.

As has been true throughout the 20 years of our existence we need more observations, and we need better observations. It is rare for a Section Report to list as many as 20 observers, which is now about 3% of the membership. In other words, our projects receive only scattered, and often barely token, support from our members. One may hope that the A.L.P.O. Observing Manual will help this situation by providing needed observing guidelines and helpful reference material conveniently available in one book.

The A.L.P.O. has long sought to foster international cooperation among lunar and planetary amateurs, and it is disappointing that contributions from colleagues in foreign countries have fallen off in recent years. Of course, international exchange must be a two-way street. Recent years have brought a certain measure of expressed interest in an amateur equivalent of the professional International Astronomical Union. If such an organization is created, we may hope that it will foster our common aims. It may also be that the time and funding required to create a new organization would be better spent in strengthening existing socities like the B.A.A. and the A.L.P.O., which are surely sufficiently international in practice even if somewhat national in original concept.

In concluding, it appears worthwhile to list those "charter members" of the A.L.P.O. who are still members today: David P. Barcroft, Ralph N. Buckstaff, Charles Cyrus, Charles A. Federer, James Q. Gant, Fred M. Garland, Walter H. Haas, Lyle T. Johnson, Russell Maag, Oscar Monnig, A. W. Mount, Elmer J. Reese, David Rosebrugh, Milton Rosenkotter, J. Russell Smith, Clyde W. Tombaugh, and the Yakima Amateur Astronomers.

Many, many people have contributed as observers, as authors, as staff members, and as workers of other kinds to whatever the A.L.P.O. has achieved during its first 20 years. These activities have brought to the writer a deep personal satisfaction. It is his hope that the Association may long endure and that, with continuing support from you, our members and readers, the future may be far better than the past.

VOICES FROM THE PAST

It has occurred to the Editor that a small selection of articles published in past issues of this journal may provide enjoyable reading for our Twentieth Anniversary Issue.

Such a selection could have been made in many ways. The first such reprinted article below was the very first article contributed to The Strolling Astronomer. It appeared in Vol. 1, No. 2, pp. 2-4, April, 1947.

Valuable Contributions to Astronomy by Owners of Small Telescopes

By: Frank R. Vaughn

It is thought by the writer that many telescopes of "amateur" size lying idle in garages, basements, storerooms, and attics, might well be engaged as valuable tools in the progress of knowledge.

There are perhaps three chief reasons for this: (1) the "amateur telescope maker" has found more pleasure in construction than in observation -- hence, after a period of "looking at the sky", the telescope has been of no further use to him (except perhaps to show to friends, or to "gaze" sporadically); (2) that the possessor of the telescope simply thinks that nothing of value can be contributed by him in this day of giant observatories and advanced techniques; (3) that the telescope-owner merely had a passing fancy, which soon died.

For those in the third group there is little here of potential interest; to those in the first and second categories, I should like to point out a few things, and to raise a few questions which may prove somewhat surprising.

The "amateur telescope maker", mentioned at first, may find observation of the moon and planets a hobby eventually even more stimulating than telescope construction (the latter is excellent preparation and background for the former). The person who thinks that "nothing of value can be contributed" by him may find himself pleasantly surprised in the knowledge that he can make a contribution of real worth, once he has actually observed systematically and carefully.

There is a class of astronomical objects which has not yet yielded fully to any technique, however advanced, and there is room for valuable scientific work on this class of objects--the moon and planets--with small telescopes. This field of astronomical endeavor has been done incalculable damage by many of the devotees who did so much to advance it, merely by the drawing of conclusions carelessly and hastily, on a basis of essentially meritorious observational work.

This matter of carefulness and caution in drawing inferences can hardly be too strongly emphasized, for it is only through established and recognized scientifically valid methods of reduction of observations that results will be "accepted" (after all, the only way in which work of any considerable merit may be eventually given deserved recognition).

What is the period of rotation of Venus? What is the inclination of its axis to the plane of its equator? What is the physical nature of its visible surface (although heavily covered with cloud; quiescent, chaotic, belted, etc.)?

What is the precise nature of some areas on the moon, the observed changes of shade and form of which, under varying angles of illumination, do not conform (apparently) with those expected if dependent on the illumination-angle alone? How is one to explain the observed apparent absence of "impact-explosions" of meteorites on the surface of the moon? In this connection, it has been reliably stated that a meteoroidal body of 1-inch diameter, moving at the rate of 20 miles/sec. relative to the moon, and striking it, would, upon contact, produce an "impact-flare" visible to observers on the earth. Do observable lunar meteors exist in the rare atmosphere of our satellite?

What is the rotational period of zones of high latitude on Saturn? It has been shown that variations in the divisions of Saturn's rings may be dependent on the relative positions of the satellites. Observations of the rings would be of great value when this problem in dynamics is solved.

Observational work on Mars needs to be continued, against the time when rather definite and accepted conceptions of its surface-nature are formed (especially in regard to the "canals" and other controversial marks).

In the above paragraphs I have presented only a few of the known problems concerning our own solar family, which may well prove to be of access with only modest instruments. And even when the above questions are settled, many will remain, for it is certain that for each answer there will be fresh questions.

Next month I shall present suggestions regarding efficient methods of using telescopes in planetary and lunar work, based on the experience of skilled observers, for there is no substitute for an excellent (if small) telescope. The observer, however talented, cannot rise above his tools.

* * * * * *

The A.L.P.O. system of Section Recorders was a gradual and necessary development. It was, of course, modelled upon the practices long found successful by the B.A.A. Tom Cave was one of our first Recorders and wrote a number of Venus Reports, one of which is reprinted below. Those now observing Venus under the leadership of Dale Cruikshank may find parts of Mr. Cave's discussion surprisingly current. This article appeared in Vol. 4, No. 5, pp. 2-4, May, 1950.

Venus Near Inferior Conjunction

By: T. R. Cave, Jr.

As Venus approached the inferior conjunction of January 31, 1950 and the planet became considerably more difficult to observe, activity might have been expected to decline. The Recorder is most happy to report, however, that a very considerable amount of work was done then by members of the Venus Section. Those reporting for this period were: Dr. J. C. Bartlett, $3\frac{1}{2}$" refl.; Mr. L. Bellot, 6" refl.; Mr. P. D. Bevis, 6" refl.; Mr. F. E. Brinckman, Jr., 6" refl.; Mr. T. R. Cave, Jr., 8" refl.; Mr. P. Chorley, $3\frac{1}{2}$" refl.; Mr. T. A. Cragg, 6" refl.; Mr. E. L. Forsyth, 6" refl.; Mr. W. H. Haas, 6" refl. and 3" refr.; Mr. E. E. Hare, 12" refl.; Mr. M. B. B. Heath, 10" refl.; Mr. L. T. Johnson, 10" refl.; Miss H. Koyama, 8" refr.; Mr. H. LeVaux, 6" refl.; Mr. B. Lane, 6" refl. and 3" refr.; Mr. S. Murayama, 8" refr.; Mr. A. W. Orton, 6" refl.; Mr. D. O'Toole, 6" refl.; Mr. G. D. Roth, $4\frac{1}{4}$" refl. All apertures are given in inches.

We wish to acknowledge and welcome the observations this month from Mr. G. D. Roth of Munich, Germany, who has contributed a number of excellent drawings, employing his $4\frac{1}{4}$" Brachyt reflector with various color filters.

THE DARK HEMISPHERE - It is rather significant that nearly all observers reported observing the dark hemisphere of Venus during January. To some it appeared dark; to others, light, with respect to the sky-background. To a few it was even by turns both light and dark, changing in only a few days. Orton, observing on January 1 (Universal Time here and later), noted the previously reported peculiar "Area A" or "Lens Area" on the unilluminated portion of the disc (refer to our January and February, 1950 issues) to be of a somewhat larger area than the crescent phase. Haas noted on January 7 that the dark hemisphere was darker than the sky with Wratten Filters #47 and #58 but was invisible without filters. Haas usually found the "Lens Area" darker than the sky during most of January. He measured the angular width (perpendicular to line of cusps) of the "Area" to be 55° on January 7. Bevis and Bellot were in excellent agreement with Haas on this same date; measurements of their drawings indicate the angular width to be 53° in the sketch by Bevis and 57° in Bellot's. Bartlett on the same date found this area lighter than the sky and the narrow region bordering the terminator; Brinckman observing two hours later on the same date noted perhaps a very similar appearance. Johnson strongly suspected the dark hemisphere to be lighter than the sky on January 8, using several Wratten and Kodachrome filters. O'Toole easily observed the dark hemisphere as darker than the sky in early January; however, on January 13 he found this hemisphere lighter than the sky without filters and with red and amber filters but pronouncedly darker than it with a neutral screen. Cave found the entire dark hemisphere very slightly lighter than the sky on January 16, but LeVaux thought the unlighted portion of the disc darker than the sky-background on January 15 and January 20. Haas on January 22 measured the east edge of the "Lens Area" to be 3°.3 west of the central meridian of Venus and the angular width to be 65°.2. He thinks that this edge remained nearly stationary near the C.M. during January, the angular width increasing as the crescent narrowed. The well-known English observer of Venus, Mr. M. B. B. Heath, observed on several occasions during January the "Lumière Cendrée" (phosphorescence of the dark hemisphere) and also a darker appearance of much of the unlighted hemisphere, using his excellent 10" Calver reflector in both daylight and twilight skies.

ANGULAR PERIMETER OBSERVATIONS - Haas was able to observe Venus on numerous occasions during January, and his fine report is extremely complete. He often measured the angular perimeter on drawings or estimated it and near the end of the month saw the cusp-extensions as very fine lines nearly completing the circle around the dark hemisphere. On January 7-8 he measured the perimeter to be 200°; on January 15 he estimated it as 190°. He noted it to be generally increasing after this time and on January 27 found it to be 215°. On this date

Lane, observing with Haas and employing a 3" refractor, thought it well over 200°. LeVaux on January 27 found the perimeter to be 210°. On this same date Hare estimated it to be 200°, while on January 25 O'Toole found it to be 210°. During the last few days of January and the first days of February Johnson, Haas, Hare, LeVaux, O'Toole, Cragg, Murayama, and Koyama all found faint lines of light extending along the limb for dozens of degrees beyond the normal cusps. Using the superb 8" Zeiss refractor at the Tokyo Science Museum, Murayama and Koyama observed with 60X at the time of inferior conjunction, Jan. 31,7^h0^m, and, to quote from their observation: "We used the 8" and could catch the planet easily. Then Venus looked like a narrow ring line, its angular perimeter being 250°-270°; and it is interesting to note that the broadest part of the ring was at about 20°-25° eastward from due south. The eastern cusp was far more prolonged than the western one, although these were very difficult to see because of the brightness of the sun."

HAAS' CLOUD BULGE - In the March, 1950 issue we discussed this feature. A few more observations are now available. On December 31 Haas found this bulge to have an altitude of about 2.1 miles by the method described in the March issue. On January 7-8 he found that the "latitude" of the center was 18° north, and his height calculations now gave a value of 3.3 miles; thus the "cloud" appeared to shift about nine degrees north from December 31 to January 7. A higher portion of the cloud may have projected upon the terminator on January 7. "Latitude" is here used as if the phase-cusps and the poles of rotation coincide.

ABOUT THE DARK HEMISPHERE - Mr. Arthur W. Orton of San Bruno, California, perhaps has cast some new and interesting light upon the cause of the peculiar appearances recently seen on the unlighted hemisphere of Venus. Mr. Orton tried a field bar experiment and after several tries feels that diffraction explains to some degree the appearance of the phosphorescence of Venus. He placed the illuminated crescent behind the field bar; in this position the faintly illuminated dark hemisphere seen when the planet was not hidden completely disappeared. He later tried another interesting experiment by cutting out a white crescent of paper and placing it on a blue-violet background. When observed under moderate light from a distance of twelve feet, the entire area between the cusps appeared darker than the blue-violet background.

REMARKS BY THE RECORDER - This article concludes the discussion of observations by the Venus Section during the period from May, 1949 to January, 1950, or of the evening apparition of Venus. It is planned in future months, while the planet is in the morning sky, to report less frequently on the work of the Section. Regular reports will probably be made only every three or four months. The Recorder would like strongly to urge all Venus observers to observe whenever possible and convenient while the planet is in the morning sky. He also wishes to thank most sincerely the many observers who have contributed such excellent work to him and hopes that they will resume their regular observing when the planet is again in the evening sky.

Notes by Editor. The experiments by Mr. Orton deserve much praise and may well shed light on the cause of the visibility of the dark hemisphere. Such experiments should by all means be repeated and extended by our readers.

The bulge near the middle of the terminator that was persistently visible to Haas from December 23 to January 9 might well argue for a very slow rotation of Venus; the cloud should not otherwise have been on the terminator for so long. An alternative interpretation could be that what was seen was part of a cloud-zone encircling much or all of the planet. The approximate average velocity of the northward drift of the cloud from December 31 to January 7 is 3 miles per hour.

* * * * * *

It was never to be expected that the A.L.P.O. would produce any appreciable amount of valuable theoretical work on the moon and the planets. Nevertheless, one theory developed by Mr. Elmer J. Reese has attracted a great amount of professional scientific interest since its first publication. The article below appeared in Vol. 9, Nos. 5-6, pp. 64-68, May-June, 1955. The illustrations for the original article are omitted here. Several major S.E.B. Disturbances have appeared since 1955. In July, 1967 Mr. Clark Chapman made a statistical study with a large computer of the validity of Mr. Reese's hypothesis for the 10 major S.E. B. Disturbances then known. He found the evidence statistically inconclusive but thought that one more Disturbance should settle the matter -- much as Mr. Reese did in 1955!

Major S. E. B. Disturbances on Jupiter
And an Apparent Clue to the True Rotation of the Giant Planet

It has long been known that the clouds at the visible surface of Jupiter show a wide variety of rotation-periods. The vigorous observations of the Jupiter Section of the B.A.A. have established the existence of about a dozen different latitudinal currents; and, in a very general way, markings near the equator rotate in about 9^h50^m (System I), and those in higher latitudes in about 9^h55^m (System II). Nevertheless, it must be stressed that only observation can establish the period of rotation of a particular surface feature.

Now one of the riddles of the ever-changing Jovian panorama is the occasional occurrence of great outbreaks of activity in the South Equatorial Belt. These are called S.E.B. Disturbances and have been recorded in 1919, 1928, 1943, 1949, 1952, and 1955. Each S.E.B. Disturbance has followed a similar pattern of development. Beginning with one or two very dark spots in the S.E.B., the activity advances in the direction of decreasing longitude at the rate of several degrees a day. The space between the S.E.B. components darkens behind this advancing front, and new spots and streaks continue to appear at or near the longitude of the initial outburst (pg. 66). Eventually the Disturbance may girdle the whole globe of Jupiter, and the S.E.B. in the longitudes covered by the Disturbance may be the most conspicuous belt on Jupiter.

In a very stimulating and perhaps extremely significant paper "A Possible Clue to the Rotation Period of the Solid Nucleus of Jupiter", J.B.A.A., Vol. 63, pg. 219, 1953, Mr. Elmer J. Reese speculates that the source of these S.E.B. Disturbances may be a gigantic volcano below the surface cloud layers. Of course, Jovian vulcanism might be very different in nature from vulcanism on the earth. If volcanic activity is the cause, then since such a volcano would be fixed in position on a solid or semi-solid core of Jupiter, the longitudes of the initial outbursts of activity in the S.E.B. should be compatible with a constant period of rotation. Mr. Reese investigated this problem and found that the longitudes of the observed initial outbursts could be related to the longitudes of two hypothetical subsurface volcanoes, each having a period of $9^h55^m42^s.66$. He suggested that the appearance of future S.E.B. Disturbances might confirm or refute this idea, and therefore the 1955 S.E.B. Disturbance was of very great interest. In recent months Mr. Reese has sent us some valuable correspondence, charts, and drawings relating to this problem of what S.E.B. Disturbances may tell us about the true rotation of Jupiter. We quote:

"There can now be little doubt that the present [1955] disturbance in Jupiter's South Equatorial Belt belongs in the same category as the other six major disturbances. Note the similarity of the longitude charts pertaining to the last three disturbances. [Mr. Reese has sent us charts for the 1949, 1952-53, and 1955 S.E.B. Disturbances. Observations were most numerous in 1949, and the chart for that year is reproduced on pg. 68. In the second column of the table on that page these abbreviations are used: D for dark, W for white, p for preceding end, c for center, and f for following end. The third column gives the beginning and ending dates of observation: the fourth column, the corresponding longitudes (II). The fifth column gives the longitude on September 3, 1949; the sixth column, the number of transits observed; and the seventh column, the change in longitude per 30 days.] The longitude of the initial eruption of the present disturbance falls very near a straight line passing through the plotted longitudes of the initial eruptions of the disturbances of 1928, 1943, 1949 and 1952. [See graph on pg. 67.] The major disturbance of 1919 and the secondary disturbance of 1943 fall on another line exactly parallel to the 1928-1955 line. Thus it seems that the disturbance of 1955 has considerably strengthened the hypothesis that the disturbances are caused by two fixed sources of commotion located beneath the visible cloud layers. If we adopt $9^h55^m42^s.66$ as the constant rotation period of the hypothetical sources and if we base a drift line on the 1943 disturbance, we have the following residuals (observed longitude—computed longitude):

1928	$+ 9^\circ$	1919	0°
1943	0	1943a	0
1949	+19		
1952	+ 9		
1955	- 8		

These residuals are large enough to make one wary of the hypothesis; and small enough to make one even more wary that the longitudes of the various disturbances were at random.

"The small X- marks on [the graph on pg. 67] show the positions of six lesser disturbances (in some cases isolated spots) in the interior of the S.E.B. Five of the six disturbances fall fairly close to one or the other of the drift lines . . . . . .

"In my opinion, the most likely explanation for the residuals between the computed and observed longitudes of the initial outbreaks would be that the observed outbreaks lie at variable distances from their source as a result of variable wind velocities in the Jovian atmosphere and variable velocities of ascent of the erupted material. I do not think that a major part of these residuals can be imputed to late discoveries of the initial outbreaks because the initial longitude can be checked and rechecked during the first month or two of the disturbance. This may seem absurd but it really is not. The volcano - if that is what it is - does not erupt once and quit, but erupts many times at irregular intervals during the life of the disturbance. Each succeeding eruption becomes visible at approximately the same longitude (II) as the first eruption, and each in turn drifts westward along the interior of the S.E.B. As a result, the interior of the S.E.B. becomes filled with dusky matter at an ever increasing distance west of the longitude of the initial eruption, but the interior of the belt remains clear and bright following that longitude - at least for the first month or two. [Refer to drawings on pg. 66.] If we plot the longitudes of the following end of a disturbance for a month or two, we can (1) obtain a reliable longitude for the place where the erupted material first penetrates the observable outer atmosphere, (2) check the rotation period of the volcano during that month or two, (3) determine whether or not the erupted material is affected by varying atmospheric winds during its ascent. A study of available data pertaining to all of the major disturbances to date gives the following results: The rotation period of the following end of each disturbance (and hence of the causative volcano) is approximately $9^h 55^m 43^s$ which nicely confirms the period already suggested for the solid nucleus of the planet. The drift of the following end of each disturbance, while usually fairly linear, does at times become quite sinuous varying as much as 15^o on either side of its mean position. Hence we have observable evidence that the erupted material can be displaced by as much as 30^o in longitude by the time it reaches the visible surface of the planet (Q.E.D.).

"Of course the validity of these postulates depends on the validity of the fundamental assumption that the S.E.B. disturbances are caused by eruptions from two fixed sources at a lower level within Jupiter."

Mr. Reese directs attention to the following extract from Astronomy, Vol. 1, pp. 368-369, by Russell, Dugan, and Stewart:

"It is probable that the visible markings on Jupiter are at different levels, - the rapidly changing ones being in the rarefied outer gaseous layers, while the more permanent ones lie deeper and probably originate from eruptions from denser layers, where disturbances may maintain themselves for a long time. The rotation period at these lower levels must be nearly uniform, - for fluid friction would soon smooth out any considerable irregularities, - and is probably about equal to that of the great red spot. The shorter periods, on this view, correspond to currents in the upper atmosphere, running in the direction of the planet's rotation. The great equatorial current, which has fairly well-defined gaseous banks, runs eastward at the rate of 250 miles an hour. Winds in the earth's upper atmosphere - also eastward - have often been observed to go half as fast." In this quotation eastward is taken as the direction of the planet's rotation and not in its more usual sense of a direction in the terrestrial sky. The required velocity for the Jovian equatorial current is comparable to that of the jet stream in the earth's upper atmosphere.

We congratulate Mr. Reese on an excellent piece of work and eagerly await the appearance of the next S.E.B. Disturbance.

* * * * * *

The following article is interesting as a summary of the response of one A.L.P.O. observing-section, namely the Saturn Section, to an unusual opportunity, namely the outbreak of white spots near latitude 60^oN. in 1960. Two drawings which accompanied Recorder Cragg's original article are omitted here. There may even be a certain need to remind current observers of the results we then secured about the rotation of Saturn at this latitude; for several references in the literature have been misleading, or at least incomplete, even on the part of persons who might have been expected to be fully informed. The article appeared in Vol. 15, Nos. 5-6, pp. 96-98, May-June, 1961.

Rotation Periods of Spots on Saturn Near Latitude 60^o North in 1960

By: Thomas A. Cragg

Bright spots in the $+60^o$ latitude region on Saturn were observed by members of the Association of Lunar and Planetary Observers (A.L.P.O.). Central meridian transits were obtained on 20 nights from May 6 through September 20, 1960, by nine different observers. Bright spots in this region (known as the North Polar Zone or NPZ) are extremely rare, none of appreciable longevity ever having been recorded before. Botham of South Africa, A. Dollfus of Pic-du-Midi, France, and others observed one or two spots in the Zone prior to May 6. In fact, perhaps the first evidence of this great surge of activity was obtained by Budine[1] on September 5, 1959, just before the close of the 1959 apparition of Saturn.

The first of the long-lived spots was the one observed by Dollfus in late April and early May, and followed to its eventual end by A.L.P.O. members. After its subsidence, the region was relatively inactive until late July and early August, when several spots burst forth almost simultaneously. These were followed ardently by the A.L.P.O. observers through September 20.

For convenience, a system of longitudes was set up using a sidereal period of $10^h40^m.0$ as the basic rotation rate and an initial epoch of 06:00 U.T. July 7, 1960, for the prime meridian. Corrections introduced in the longitude tables include only light-time, Saturn's advance in longitude, and the effect of the earth's motion on the observed Saturnian longitudes. No phase correction was included since other errors in the observations exceed this correction very substantially.

Sufficient central meridian transits of five spots were observed to obtain a fairly accurate rotation rate. The observations and the resulting periods are listed below (all times and dates are U.T.):

Spot No. 1

Date	Time	Long.
1960, May 6	11^h30^m	$10^\circ.9$ Cr*
May 10	11 21	5.5 Ro
May 10	11 25	7.7 Cr
May 22	11 13	359.7 Cr
May 26	11 12	358.7 Cr.

$\Delta\lambda = -12^\circ$ in 20^d
$P = 10^h\ 39^m.5$

Spot No. 2

Date	Time	Long.
1960, Aug. 9	05^h38^m	77.5 Ro
Aug. 25	05 30	71.6 Cr
Aug. 25	05 31	72.2 Ro

$\Delta\lambda = -5^\circ.5$ in 16^d
$P = 10^h\ 39^m.7$

Spot No. 3

Date	Time	Long.
1960, Aug. 5	05^h51^m	85.0 He
Aug. 9	05 49	83.7 Ea
Aug. 9	05 49	83.7 Cr
Aug. 25	05 48	81.7 Ro
Aug. 25	05 48	81.7 Cr

$\Delta\lambda = -3^\circ$ in 20^d
$P = 10^h\ 39^m.9$

Spot No. 4

Date	Time	Long.
1960, July 23	07^h38^m	$55^\circ.1$ Ro
Aug. 12	07 30	50.1 Ro
Aug. 12	07 43	57.4 Ea
Aug. 13	04 52	51.1 Ro
Aug. 13	04 57	53.9 Ea
Aug. 13	05 00	55.6 He
Aug. 25	04 54	51.2 Em
Aug. 25	04 54	51.2 Ro
Aug. 25	04 54	51.2 Cr
Aug. 29	05 07 (f)**	58.3 He
Sept. 2	04 55***	51 Ri***
Sept. 6	04 52	49.0 Ro

$\Delta\lambda = -6^\circ$ in 45^d
$P = 10^h\ 39^m\ 56^s$

Spot No. 5

Date	Time	Long.
1960, Aug. 11	09^h00^m	10.9 Ea
Aug. 25	03 58	19.8 Cr
Aug. 25	04 00	20.9 Ro
Aug. 29	04 10 (f)**	26.2 He
Sept. 6	04 02	20.9

$\Delta\lambda = +10^\circ$ in 26^d
$P = 10^h\ 40^m.3$

*See "Key to Observers" at end of paper.
**Following end of spot in transit.
***Value approximate.

A simple arithmetical mean of the above periods yields:

$$\bar{P} = 10^h\ 39^m\ 52^s.$$

Other central meridian transits were observed for several other spots, but it appeared that no very reliable period could be obtained from them. They follow, grouped where it appears as if the same spot was being observed:

Date	Time	Long.	Date	Time	Long.
1960, Aug. 29	$02^h\ 47^m$***	340°*** Sc	1960, Sept. 12	$03^h\ 28^m$	$180^\circ.6$ Cr
Sept. 13	04 20	299.7 Ha	Sept. 20	03 18***	173*** Cr

Date	Time	Long.		Date	Time	Long.	
1960, Sept. 12	04 56	230.1	Ha	1960, July 25	07 04	215.9	Ro
Sept. 13	02 33	239.5	Ha				
Sept. 20	04 33	215.6	Ha	Aug. 2	03 48	105.7	Cu
				Aug. 25	06 10	94.0	Em
				July 12	04 36	42.8	Cu

***Value approximate.

The significance of the above results is that Moore in 1939 found a spectroscopic rate at a latitude of 57° at least an hour longer than that for the equator.[2] This would imply a spectroscopic rate near 11^h15^m as compared with $10^h39^m52^s$ found by the central meridian passages of several spots.

References

1. "Saturn in 1959", by T. Cragg, The Strolling Astronomer, Vol. 15, p. 61, 1961.

2. Astronomy, by Russell, Dugan, and Stewart (1945 edition).

Key to Observers

Cr = Cragg. 12" refr., 12" refl., 6" refr., 6" refl.
Cu = Cruikshank. 40" Yerkes refr. at 28 to 40" aperture.
Ea = Eastman. 12½" refl., 12" refr.
Em = Emig. 8" refl., 6" refl.
Ha = Haas. 6" refl.
He = Herring. 12½" refl.
Ri = Rippel.
Ro = Robinson. 16" refl., 10" refl., 6" refl.
Sc = Schneller. 8" refl.

A NEW DISCIPLINE FOR THE A.L.P.O., THE LUNAR LIBRATION CLOUD SECTION

By: Walter J. Krumm, A.L.P.O. Lunar Libration Cloud Recorder

It is believed that few have seen the lunar libration clouds, not because of their low luminosity especially, but primarily because of poor or unavailable ephemerides. An observing ephemeris has hence been compiled to indicate those times when observations of either L_4 or L_5 should be attempted. Observations of the lunar libration clouds have shown that these luminosities do not appear at the predicted positions, being off in both right ascension and declination, and that they seemingly vary in intensity. It is the aim of this new A.L.P.O. section to secure sufficient observations of this phenomenon to answer the many questions that are observationally possible, and to produce the necessary "observed minus predicted" values needed to calculate a precise ephemeris.

Visual Techniques

The lunar libration cloud luminosities are near the limit of visibility and are just above the brightness of the night sky. Therefore, it is of primary importance to eliminate all artificial light and to have a dark, transparent sky. Use naked-eye observing only as any magnification will lose these faint luminosities entirely. For the first few attempts to see these "clouds", select an observation that will give maximum conditions; namely, near full phase, largest local elevation, greatest separation from the ecliptic, a full observing window, and a good position against a background of few and faint stars. Timewise, the longer L_4 remains in the sky after moonset or the end of twilight, the better, since one becomes more dark adapted; or the longer L_5 is up before moonrise or the advent of morning twilight, the better, to overcome the atmospheric extinction of a low local elevation (for one is supposedly already dark adapted here). By all means, wear red goggles if lights are present or dark adapt one's self for one-half hour before observing.

After locating the libration area against the background of stars, search an area 15° x 15° for any faint nebulosity to allow for the difference between the observed and the predicted positions. If any luminosity is found, observe another area nearby to see if wishful thinking has occurred; then return to the sighting area to confirm its existence. These areas are small enough that averted vision is necessary (approximately $3^{\circ} \times 4^{\circ}$ according to one's threshold) so that they will disappear upon direct viewing. Determine the size, shape, orientation and position; and plot on a star map to scale. Note observer's time, latitude, and longitude because these are needed later to compute a true predicted position for the "observed minus predicted" value.

Later, when one gets "acquainted" with the knack of lunar libration cloud observing, less choice positions should be attempted. A series of three or more chronological sightings are vital, and scattered sightings are of value. If the libration luminosity is observed, check the same area on the following night, if possible, to see whether the luminosity has disappeared (i.e., moved ahead along the lunar orbit to a new position).

Photographic Techniques

There are only two known published reports on photographs of the lunar libration clouds, and these include many doubtful cases; there have been many negative attempts to photograph the clouds. It follows, then, that only suggestions can be made at this time--like the blind leading the blind! It is believed that the same procedures as for photography of the far reaches of a comet tail should be used. It appears that a person such as Alan McClure with his wide experience of cometary photography could answer more questions than one less experienced. If a long exposure is to be made, one should track at the lunar rate, and this may prove difficult with nothing for a guide. A wide angle lens should be used to cover a large area to compensate for the variation in observed and predicted positions and to overcome the vignetting of the lens. Also, two photographs of the same area are absolutely necessary--one of the libration cloud and one on a preceding or following night to use for comparison. These should be taken and developed under strict control conditions. Isodensitometry will be used on any photograph thought to contain a lunar libration cloud image.

An observing ephemeris may be obtained from Walter Haas or the Lunar Libration Cloud Recorder for the asking. Sample pages are published here as Figures 1 and 2.

STEEP PLACES PROGRAM PROGRESS REPORT

By: Charles L. Ricker, ALPO Lunar Recorder

In several previous articles in this *Journal*, an attempt has been made to inspire interest in a program of observing steep places on the Moon.[1,2] Although there has not been a wide response, there has been an enthusiastic one! Participating observers have submitted a large number of observations, and the results are interesting enough to warrant publication at this time.

The following observers have participated in the program to date:

Larry Dart	San Jose, Calif.	8" Refl.
Rev. Kenneth Delano	New Bedford, Mass.	12½" Refl.
Carl F. Dillon, Jr.	Lowell, Mass.	6" Refl.
Charles L. Ricker	Marquette, Mich.	10" Refl.

The Recorder wishes to thank these observers, without whose help the program would never have got off the ground.

Taking as a reasonable starting point Joseph Ashbrook's "working list"[3], the results have been analyzed as follows:

1. Formations with observed slopes greater than those indicated in the working list.
2. Formations containing extremely steep slopes.
3. Formations which have been observed to contain steep places, but ones not appearing on the working list.

In the cases of numbers 1 and 2 above, these formations should be observed as often as possible when over 30° from the terminator in order to verify the observed unusually steep slopes. One common complaint from observers has been that it is difficult to distinguish true black shadow from the normal high-sun darkening which occurs in many formations. It may help to observe a given formation on several consecutive nights, at which time the difference should be more apparent. In case 3 above, the fact that they have been included in some cases is the result of only one observation, and confirmation by other observers is essential.

Notes on the Ephemeris

Columns 1, 2, 3, 4 and 5 - Straightforward.

Column 6 - A "full" observing window indicates the 60 degrees from moonset to L_4-set, or from L_5-rise to moonrise. Any lesser time denotes that the observing window is limited by twilight.

Column 7 - Calculated for the author's latitude of 37 degrees. Need not be considered too heavily unless one is farther north, especially during the summer months. Or, if you wish, use:

$$\sin a = \sin \delta \sin \varphi + \cos \delta \cos \varphi \cos h$$

where

a = local elevation
δ = declination of cloud
φ = observer's latitude
h = hour angle = local siderial time - R.A. of cloud

Column 8 - Phase Angle: The position of the libration cloud with respect to the Sun. 0 degrees at "new," 90 degrees at "quarter" and 180 degrees at "full," etc.

Column 9 - L: The latitude of the libration cloud, or, its separation from the ecliptic.

Column 10 - Location of cloud against background of stars.

Column 11 - Position: An "OK" indicates that the cloud location is favorable and should be limited by local conditions only. A "Try" indicates possible interference from nearby object (Milky Way, Gegenschein, bright star or nebulae, etc.). A"?" position denotes that observing conditions are poor or slim. A "NG" = no good, impossible or worse!

Columns 12 and 13 - The position of the Gegenschein at moonrise or moonset as the case may be. This is to be used as a check of magnitude. It should be noted that the L_4 cloud has been observed when the Gegenschein (supposedly more luminous) was not seen.

Figure 1. "Notes on the Ephemeris" of the Lunar Libration Clouds prepared by Mr. Walter J. Krumm, A.L.P.O. Lunar Libration Cloud Recorder. See also text of his article in this issue.

******

Following are the above formations in order. The slope values given are the latest observed maximum slopes, and unless otherwise stated are for the east (IAU directions) walls.

Case 1. Formations with observed slopes greater than those indicated on the working list.

Agrippa	61°	Central Peak	Burg	41°	
Aristillus	42		Conon	43	
Autolycus	45		Gay-Lussac	42	
Birt	49		Herschel	54	W Wall
Bullialdus	41	(45°W Wall)	Lambert	41	
Macrobius	48		Thaetetus	43	W Wall
Mädler	49		Theophilus	62	E Wall and Central Peak
Manilius	36		Piton	44	(W Slope)
Pytheas	40				

LUNAR LIBRATION CLOUD EPHEMERIS

CLOUD	DATE	RIGHT ASCEN.	DEC.	UNI-VERSAL TIME	OBS. WINDOW HRS.	MAX. LOCAL ELEV.	PHASE ANGLE	L	CONST.	POSITION	GEGENSCHEIN R.A.	GEGENSCHEIN DEC.
L_4	Sept. 29, '67	$12^h53'$	$-4^{\circ}18'$	$23^h56'$	$0^h18'$	Moonset 28°	$7^{\circ}30'$	$+1^{\circ}20'$	Virgo	OK	$0^h23'$	$+2^{\circ}26'$
	Oct. 1	13 45	-10 54	0 30	0 48	25	19 45	0 00	Virgo	OK	0 26	2 50
	2	14 40	-16 40	1 01	1 20	23	27 30	-0 40	Libra	OK	0 30	3 14
	3	15 41	-22 22	1 29	1 56	22	46 45	-2 40	Libra	OK	0 34	3 38
	4	16 45	-26 07						Milky Way	NG		
	5	17 54	-28 03						Milky Way	NG		
	6	19 03	-27 48						Milky Way	NG		
	7	20 10	-25 30	3 39	Full	27	110 30	-5 25	Capricornus	OK	0 48	5 13
	8	21 13	-21 25	4 24	Full	31	125 15	-5 05	Capricornus	OK	0 52	5 33
	9	22 12	-15 50	5 18	Full	37	139 00	-4 25	Aquarius	OK	0 56	6 00
	10	23 05	- 9 56	6 20	Full	43	151 15	-3 40	Aquarius	OK	1 00	6 25
	11	23 54	- 3 36	7 24	Full	48	162 30	-2 35	Pisces	OK	1 04	6 47
	12	0 42	+ 2 50	8 30	Full	53	173 30	-1 35	Pisces	OK	1 08	7 12
	13	1 29	9 00	9 35	$3^h11'$	57	175 45	-0 15	Pisces	OK	1 12	7 35
	14	2 17	14 35	10 38	2 11	58	164 45	+0 55	Aries	OK	1 16	8 00
	15	3 05	19 25	11 38	1 10	59	153 45	2 05	Aries	OK	1 20	8 22
	16	3 55	23 20	12 36	0 13	58	142 00	2 55	Taurus	Try	1 23	8 45
L_5	Oct. 22	$0^h37'$	$+2^{\circ}12'$	$3^h09'$	$0^h19'$	Moonrise 29°	$163^{\circ}15'$	$-1^{\circ}35'$	Cetus	OK	$1^h44'$	$+10^{\circ}45'$
	23	1 17	7 25	3 51	1 02	34	172 15	-0 35	Pisces	OK	1 48	11 08
	24	2 05	13 15	4 39	1 51	39	176 45	+0 45	Aries	OK	1 52	11 30
	25	2 53	18 18	5 37	2 50	45	165 45	1 45	Aries	OK	1 56	11 51
	26	3 48	22 53	6 39	3 53	49	153 00	2 55	Taurus	?	2 00	12 15
	27	4 45	26 08	7 47	Full	54	139 45	3 55	Taurus	OK	2 04	12 35
	28	5 53	28 03						Milky Way	NG		
	29	6 54	27 58	10 08	Full	57	109 30	5 05	Gemini	OK	2 12	13 18
	30	8 03	25 50	11 21	Full	58	93 15	5 20	Cancer	OK	2 16	13 39
	31	9 07	21 55	12 34	Full	59	78 15	5 15	Cancer	OK	2 20	13 59
	Nov. 1	10 10	16 12	13 50	$2^h49'$	58	63 30	4 35	Leo	Try	2 24	14 08
	2	11 10	9 17	15 10	1 32	57	49 30	3 10	Leo	OK	2 28	14 40
	3	12 08	1 43	16 30	0 20	51	36 00	2 20	Virgo	OK	2 32	14 59

Figure 2. Sample page of the Ephemeris of the Lunar Libration Clouds. See text of Mr. Krumm's article and explanatory notes in Figure 1. Predicted values for other dates may be obtained from Mr. Krumm or from the Editor.

Case 2. Formations containing extremely steep slopes.

Agrippa	61° Central Peak.		Isidorus	57°	
Abulfeda	49	W Wall	Lalande	60	W Wall
Birt	49		Monge	51	
Descartes	47	W Wall	Theophilus	62	E Wall and Central Peak
Geminus	51		Tisserand	51	
Herschel	54	W Wall	Torricelli	49	
Horrocks	55				

Case 3. Formations not appearing on working list.

Abulfeda	49°		Isidorus	57°	
Alfraganus	45	W Wall.(E Wall on list)	Lalande	60	Outer E Rim.
Apennine Mts.	29		Menelaus	42	
Atlas	38		Monge	51	
Capella	40		Ritter	35	
Cyrillus	40		Santbech	47	
Daniell	28		Sabine	36	E Wall (W Wall on list).
Delambre	35		Taylor	33	
Descartes	47	W Wall	Tisserand	51	
Fauth-Fauth A	45		Zollner	35	
Horrocks	55				

It can be seen from the above that much work remains to be done, and serious lunar observers can be of GREAT ASSISTANCE in resolving some of the above problems so that a refined working list can be produced. So far, not enough confirmed data exist to attempt a statistical analysis of the observations; and it is only through many more observations that such data can be gathered. The observing time spent on this program need only be a few minutes at each session, and need not interfere with other lunar programs. It is hoped that our regular lunar observers will respond to this appeal, and donate a little of their observing time to this very worth-while program.

References

1. Ashbrook, Joseph, "Steep Places on the Moon", Strolling Astronomer, Vol. 17, Nos. 7-8, pp. 136-137, 1963.

2. Ricker, Charles, "Lunar Section: The Steep Places Program", Strolling Astronomer, Vol. 20, Nos. 1-2, pp. 4-5, 1966.

3. Ashbrook, Joseph, "A Working List of Steep Places on the Moon", Strolling Astronomer, Vol. 20, Nos. 3-4, pp. 37-42, 1966.

COMET MITCHELL-JONES-GERBER 1967f

By: Dennis Milon, A.L.P.O. Comets Recorder

At the end of June a naked eye comet was discovered in the Southern Hemisphere, but it was a very difficult object for United States observers as it moved south parallel to the sunset horizon. One of the discoverers, Merv Jones of Maryborough, Queensland, Australia is a contributor to the British Astronomical Association, and has had observations of Jupiter and comets in the BAA Journal. He discovered the comet while sweeping with binoculars on July 1, 1967 UT. It was then 5th magnitude with a greenish tail several degrees long.

Michael McCants observed the comet on the evening of July 4th (July 5 UT) after receiving an IAU telegram. From his location at a Nike Site 10 miles west of Austin, Texas, the comet was visible in 7x50 binoculars at magnitude 4, compared to Sigma Leonis. With a 10-inch reflector he could see a 15' coma and a $\frac{1}{2}^{\circ}$ tail. The comet was only 5° above the horizon.

José Olivarez of Mission, Texas, observed the comet on July 8th at 2:45 UT in 7x50 binoculars. The magnitude was estimated at 5.5; and he saw a 2° tail, which had a bright northern edge.

Photographs taken at Mount Stromlo Observatory show a round coma and a tail with filaments around a narrow center-ray.

Unsuccessful searches for 1967f were reported by Raymond Rea, Gordon Solberg, R. B. Minton, John Cotton, Tom Middlebrook, and J. Russell Smith.

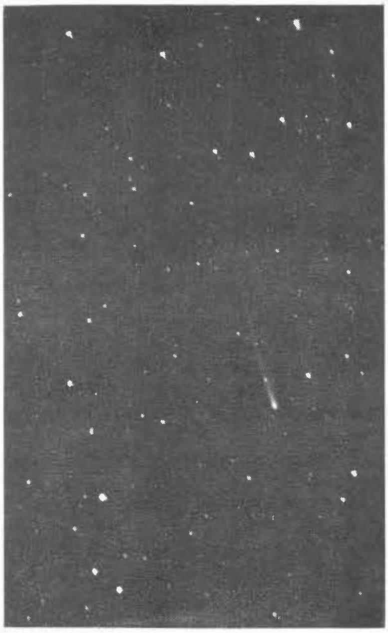


Figure 3. Photograph of Comet Mitchell-Jones-Gerber 1967f by J. Locke of Maryborough, Queensland, Australia on July 3, 1967, 8^h25^m-8^h38^m, U.T. 50-mm. f/2.9 camera with 35 mm. Tri-X film. Photograph contributed to the A. L.P.O. Comets Section by Mervyn V. Jones of Maryborough, a co-discoverer of the comet. A 4-degree tail present on original print. Bright star just to the upper right of comet's head is Kappa Cancri, visual stellar magnitude 5.24 in Catalogue of Bright Stars (1964). On this date comet's visual magnitude was estimated at 5 by both Philip Mead and V. L. Matchett in Australia.

On July 20, 1967 Mr. Mervyn V. Jones wrote of the comet: "It was quite easy to see with the naked eye at maximum but has now faded considerably." Mr. Matchett recorded a magnitude of 7.5 on July 16.36, U.T.

Photograph shows orientation of comet in Australian sky, with horizon at bottom and north to the right.

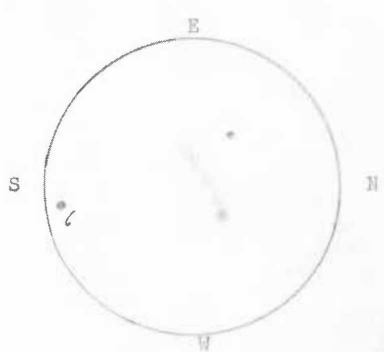


Figure 4. Sketch of Comet Mitchell-Jones-Gerber 1967f as observed in 7x50 binoculars by José Olivarez and Tom Solis of Mission, Texas on July 8, 1967 at 2^h45^m, Universal Time. Estimated stellar magnitude 5.5. Head a strong soft glow with no star-like nucleus. Tail estimated to be two degrees long and brighter on northeastern edge.

An orbit calculated by Brian Marsden from approximate positions indicates that the comet will be visible only to far southern observers. Perihelion was on June 17, 1967 UT at 0.18 astronomical units. By the end of August, it is predicted to be only 10th magnitude, on August 30th located at 12^h51^m, -35° 51'. [Mr. Milon wrote this note on July 20, 1967.]

BOOK REVIEWS

The Telescope Handbook and Star Atlas, by Neale E. Howard. T. Y. Crowell Co., 1967, 226 pp., 8.25"x10.75". $10.00.

Reviewed by H. Willard Kelsey

This book is the result of N. E. Howard's many years of association with secondary school students in the field of astronomy. It can be considered a companion to his previous work, "Standard Handbook for Telescope Making". The author has definitely achieved his purpose, which is to assist the amateur observer in understanding what he may reasonably expect in telescope performance, and to suggest methods of finding and observing a large number of celestial objects.

Two chapters are utilized in presenting the capabilities and limitations of various instruments. Subject matter such as aperture and image brightness, resolution, definition, magnification, and telescope field are discussed, as well as the optical deficiencies of spherical aberration, astigmatism, coma, distortion, diffraction, and chromatic aberration. The instrumentation normally available to the amateur, namely the refractor, Newtonian reflector, and compound telescopes of the Cassegrain and Catadioptric design, are analyzed with respect to their advantages and disadvantages; nor are eyepieces, finder 'scopes, and filters omitted.

The complete instructions for getting acquainted with the celestial sphere are enhanced by four full-page seasonal constellation charts which are based on 40° north latitude at about 8:30 P.M. by local time. The latter chapter is followed by another in which the systems of astronomical time, telescope mountings and their alignment, and the adjustment and use of setting circles are discussed.

The remainder of the text is concerned with the Solar System including comets, meteors, and satellites. The stars--single, double, and variable, as well as star clusters, nebulae, and the galaxies are introduced. Celestial photography is not overlooked. The sky glows or auroras, Zodiacal Light, Gegenschein, and the "green flash" conclude this comprehensive coverage of amateur observational astronomy.

The Star Atlas is composed of fourteen star maps which cover the entire celestial sphere. Each of these maps is unusual in design since each consists of a basic map and a vellum overlay. The basic map portrays the objects that are visible to the naked eye, while the overlay adds the features that will be seen through the telescope. Several of the overlays were compared with charts of a larger scale, and no serious error in registration was noted. Following the star maps is a Gazetteer, which includes an alphabetical list of 234 named stars, a catalog of visual binaries, short and long-period variables, open and globular clusters, and planetary, diffuse, and extragalactic nebulae. The periodic comets, annual meteor showers, and even some of the visible earth satellites are listed. The Gazetteer contains complete descriptive information; and it is of interest that positional information, where applicable, is given for epoch 1970. The Star Atlas concludes with the 104 objects of the Messier Catalog, which are listed by season and right ascension.

The remainder of the book includes an appendix of useful tabular information, a glossary, a comprehensive list of reference material, and an index.

In presenting a discussion of a subject encompassing the universe, it would be expected that little more than a survey could be accomplished. However, Mr. Howard has successfully exceeded this objective by eliminating material that is not pertinent to the achievement of his goal, which is to instruct the amateur observer in telescope performance and to assist him in establishing an observational program. Additional assistance is provided, beyond the scope of this book, by suggesting further study with the listed reference material and by association with an organized observational group such as the A.L.P.O. and the A.A.V.S.O.

There are in excess of 100 drawings, tables, and plates, which adequately supplement the text. Mathematical discussions are presented at the secondary school level, and when necessary they are immediately followed by the solution of a practical example.

Criticism is directed to the error in labeling the axes of the equatorial mount in the drawing on page 3. Also, the statement that filters serve two main purposes, to reduce glare at low power and to improve definition by providing more contrast is debatable since visual colorimetric studies incorporating filters are of equal or greater importance. On page 67 there are NASA pictures of the landing site of Ranger IX together with an excellent description of the lunar surface at this location. However, there is no mention made in the text of the formation concerned; but an included drawing will identify it as Alphonsus to those familiar with the Moon. A rather confusing statement is made on page 80 regarding the position of Mars with respect to Earth when at quadrature. However, an adjacent drawing clarifies the positional statement.

This Handbook will be invaluable to prospective amateur observers who are contemplating the selection and use of their first telescope. For those observers at the intermediate level, there is also considerable information of value available. For these reasons "The Telescope Handbook and Star Atlas" should enjoy an active circulation from the A.L.P.O. Library.

******

Starlight Nights: The Adventures of A Star-Gazer, by Leslie C. Peltier. Harper and Row, 1965, 236 pages, 28 drawings by the author. Price $4.95.

Reviewed by H. Willard Kelsey

Leslie C. Peltier, an internationally recognized amateur astronomer, has written an autobiography that is both entertaining and instructive. Since his studies have not been confined to the observation of variable stars, his reminiscences will arouse the interest of those readers whose experience has encompassed the denizens of Nature, celestial wonders, and things rural.

Mr. Peltier's account begins with the wonder that was instilled in him at ages five and seven when he sighted the Pleiades and Jupiter respectively, and their meaning was explained to him by a Mother and a Father who were sympathetic to a curiosity that obviously has never ceased to grow. These occurrences were followed by an interval of ten years, during which he describes himself as the keeper of the family cows and tells how through them he became acquainted with the wonders of Nature that existed in their environment. However, this period wasn't completely devoid of astronomical interest since it was possible for him to witness the passage of Halley's Comet and Comet 1910A.

It was on a clear night of Leslie Peltier's fifteenth year that he suddenly realized that he did not know the name of a single star. This situation was changed the following night when through the assistance of Martha Evans Martin's classic, <u>The Friendly Stars</u>, he identified Vega and was launched upon an infinite interlude of star-gazing. The purchase of his first telescope soon follwed. It was christened "The Strawberry Spyglass" because of its association with 900 quarts of berries, the picking of which provided the funds for its procurement. Its 2-inch objective was accompanied by 35x and 60x eyepieces. Young Leslie established a ritual by initially viewing Vega through this instrument and each of his successive telescopes.

The observation of variable stars was his first interest, and he soon joined the American Association of Variable Star Observers (AAVSO). It was on the night of March 1, 1918 that he made an estimate of the variable star, R Leonis. It was the first of more than 110,000 estimates that have accumulated in his consecutive monthly reports to the AAVSO. The author states: "Verily, one can easily become an addict".

As a result of his submitting estimates from 190 observing nights during the first year, the AAVSO suggested that they loan him a 4-inch refractor. This instrument was mounted out of doors in a cow pasture. The Observatory that was later built on this site provided desirable conveniences, but he remarks that it deprived him of his nocturnal gallery of curious cows. This building next housed the 6-inch, f:8 refractor that was offered by Princeton University. It is related that Zaccheus Daniel started this instrument on an outstanding career by the discovery of three comets with it, one in 1907 and two more in 1909. To these Mr. Peltier has added twelve comets, the first of his discoveries occurring on Friday, November 13, 1925.

The author describes his observations of the partial eclipse of the sun on June 8, 1918 and the initial brightening of Nova Aquilae that same night. This was the first of six novae that he has discovered. The old nova, T Coronae, was examined from night to night for twenty-five years, but its brightening was missed in 1946 when the comfort of a warm room at 2:30 A.M. overcame his desire to journey forth into a cold February night.

Early in this busy period, a five-month honeymoon was enjoyed in the Southwestern States. It could be expected that a marriage of shared enthusiasms would result in a very diversified camping trip that included collecting epitaphs, archaeologically exploring cave dwellings in the precipitous walls of the Rio Grande, collecting hyalite, and continuing the variable star estimates with the 6-inch, which naturally accompanied them.

The 6-inch was eventually moved from the pasture into a transportable Observatory located on the tow path of the abandoned Miami and Erie Canal, which happened to be adjacent to the Peltier backyard. This structure is Peltier-designed and is designated the Merry-Go-Round Observatory since it incorporates in a single rotating module the 6-inch comet seeker, an observing chair, a chart table and light, and the observer. This unit and a 12-inch Clark refractor are now in emplacement on a site that is the ultimate of an amateur astronomer's desire.

The 12-inch Clark, complete with Observatory, transit-room, and accessories, was the gift of Miami University of Oxford, Ohio. Today, Mr. Peltier divides his observing time between the Clark and the 6-inch, surrounded by natural and co-operative barriers to the encroachment of those things that are not compatible with observing in an urban area.

Leslie C. Peltier's enthusiasm and skill as an observer have often been recognized.

The International Astronomical Union appointed him a member of its Commission 27 on variable stars; Dr. Harlow Shapley referred to him as "the world's greatest nonprofessional astronomer", the Western Amateur Astronomers awarded him the G. Bruce Blair Medal in 1967, and a mountain in southern California has been named after him. Mount Peltier is also the site of the Ford Observatory.

Mr. Peltier recounts the events of his life with a precision and delightful humor that has created a book that can and will be read repeatedly by those of all ages who enjoy the telling of a marvelous story.

Postscript by Editor. Those who met and heard Mr. Peltier during the W.A.A.-A.L.P.O. Convention at Long Beach, California on August 16-19, 1967 had a rare and deeply memorable experience. He is truly one of the great spirits of our times, and one must regret the rapid urbanization of the skies which he has known and loved throughout a busy and useful life.

******

The Structure and Evolution of Galaxies, by the Solvay Institute of Physics. John Wiley and Sons, 1965, 174 pp., $9.00.

Reviewed by Clark R. Chapman

This technical volume comprises the Proceedings of the 13th Conference on Physics at the University of Brussels, held in September, 1964. It contains ten fairly brief review articles on various subjects related to galaxies presented by some of the leading astrophysicists in the field. Particularly important are the verbatim discussions of each report by the various participants in the conference. The general outline is as follows: two articles on the structure of galaxies, an article on galactic magnetic fields, two articles about stellar formation and evolution, two on supernovae, and three on extra-galactic radio sources.

It should be stated at the outset that this is not a book for the layman or even the college student. Although the articles are more general and less mathematical than most technical reports in The Astrophysical Journal, it is doubtful that anyone with less training than a graduate student in astronomy or physics will profit from the book. Unfortunately, though it might have been otherwise, the book will probably be used only by specialists in the fairly narrow field of galactic astrophysics.

Even with this limitation, the book is only moderately successful. Unfortunately, the first article by Ambartsumian is barely intelligible because the poor translation into English was not edited. Consider his concluding sentence: "But since work on interpreting the observed phenomena is not yet, even in broad outline, complete (above we called this work the first stage of theoretical study) it is hard to draw a line of comparison between the various models constructed and the reality." The second and fourth chapters are also of little value since they are but sketches of much fuller surveys published in the IAU Transactions and the University of Chicago series.

The book improves as the end is approached, but it by no means becomes any easier. Salpeter's discussion of stellar evolution is particularly useful and basic, especially the analysis of stellar birthrate and luminosity functions. Minkowski's brief summary of the pertinent observed characteristics of the two types of supernovae is complemented by Hoyle's good review of theoretical interpretations of such novae. The last three chapters on radio sources were useful when presented in 1964 but are already rather obsolete. This is particularly noticeable where quasars are discussed; the highly regarded local model for quasars is not memtioned.

Perhaps of greater interest to readers who are not specialists in galactic astrophysics are the question and discussion sections following each report. These tend to set the formal reports in some perspective and help the reader to appreciate how incomplete is our understanding of galactic evolution.

The book has practically no illustrations, and I found an uncommon number of typographical errors. Although I am not qualified to criticize the validity of the scientific work (which I presume to be of the first class), I do suspect that few of the articles have either the breadth to be of use to anyone outside this narrow specialty or the basic insight into these difficult problems to render the reviews of particular lasting value.

******

The Sun and the Amateur Astronomer, by W. M. Baxter. W. W. Norton Co., New York, N.Y., 1963, 167 pages. Price $5.95.

Reviewed by Rodger W. Gordon

Most books on astronomy today present their subject matter in a comprehensible way, and this book is no exception. However, it is different in that the author presents his material in a lucid, witty, chatty, and informal manner. After you read the first 20 pages or so, you feel that you have known Mr. Baxter all your life. In contrast, after you finish a standard astronomical work, you may know the subject matter; but the author and his "personality" remain as obscure as ever. "The Sun and the Amateur Astronomer" is a refreshing change from the usual "dry" text. Technical problems are explained in a way easily understood by even the youthful novice; and most of the observing problems associated with the sun are given fully detailed, yet extremely clear, explanations.

Mr. Baxter describes the solar equipment of other amateurs, and it is pleasing to know that in this day of the "fetish" for larger and larger apertures, Mr. Baxter regards the 3" or 4" refractor as most efficient for solar work. He points out, though, that he is prejudiced on this matter since he owns a clock-driven 4" refractor.

Some observers (including myself) may disagree with Mr. Baxter's statements that projection methods show smaller and fainter solar details than direct observation, but this is a minor disagreement since some amateurs are definitely unable to see more delicate detail by direct observation while for others the opposite is true.

Many amateur photos of the sun (mostly those of the author) are included, and the detail is remarkable for small instruments (3"-6"). Also included are Baxter's solar observing setup in his Observatory. The amateur considering specializing in solar work would do well to study carefully these photos for helpful hints on any problems he may encounter about building or equipping a solar Observatory.

I found no typographical errors in the book, and the plates are excellent in their reproduction characteristics. After reading this book, more amateurs will be willing to observe a most neglected object. Mr. Baxter's book is a practical guide, and its informal style makes it suitable for any level of reading. It deserves a place on every amateur's bookshelf.

LATITUDES ON SATURN: A NOTE ON COMPARING METHODS

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

On May 6, 1967 Mr. Gary Wegner, then with the Lunar and Planetary Laboratory of the University of Arizona at Tucson, wrote me and communicated results of measuring some high quality photographic images of Saturn for latitudes. He invited me to compare results with any latitudes I might have from a method of direct visual estimation (an unpublished paper on this subject was given at the Tucson Convention of the A.L.P.O. in 1966), and I found one such set of estimates. The interpretation of this comparison given in this paper is wholly my own. The "ratio" in Tables I and II is a quotient of two distances, both measured along the central meridian of Saturn, the one distance that from the center of the disc to the position of the feature measured, and the second distance that from the center of the disc to either the north or the south limb. Moreover, "ratio" is plus for features north of the center of Saturn, and minus for those to the south; its value thus ranges from +1 to -1.

Table I summarizes the photographic results. The standard deviations are supplied for both the measured positions and the corresponding Saturnicentric latitudes. Calculations by Gary Wegner followed the formulae in A.F.O'D. Alexander's book The Planet Saturn. The ratio of the equatorial radius of Saturn to its polar radius was, however, assumed to be 1.11 rather than the value of 1.12 adopted by Dr. Alexander. On this date B (the tilt of the axis of Saturn to the earth) was $-1^{\circ}.00$, and B' (the tilt of the axis to the sun) was $-1^{\circ}.51$.

Table I. Latitudes on Saturn from Measures of Photographs by Gary Wegner. September 25, 1966, 5 hrs., U.T.

Position	No. of Measures	Ratio	Saturnicentric Latitude
North North Temp. Belt (?)	6	$+.7323 \pm .024$	$+41^{\circ}03' \pm 46'$

Position	No. of Measures	Ratio	Saturnicentric Latitude
N. edge N. Eq. Belt	13	+.3751±.004	+19°00'± 46'
Center N. Eq. Belt	20	+.3002±.003	+14 48 ± 10
S. edge N. Eq. Belt	19	+.2330±.004	+11 18 ± 13
Center Eq. Zone North	19	+.1558±.007	+ 7 05 ± 23
N. edge "Shadow Rings"	10	+.0833±.005	+ 3 18 ± 18
Center "Shadow Rings"	20	+.0165±.004	- 0 09 ± 15
S. edge "Shadow Rings"	10	-.0451±.006	- 3 20 ± 20
Center Eq. Zone South	20	-.1470±.003	- 8 38 ± 11
N. edge S. Eq. Belt	20	-.2352±.005	-13 19 ± 17
Center S. Eq. Belt	10	-.3284±.008	-18 25 ± 25
S. edge S. Eq. Belt	2	-.4210±.006	-23 44 ± 18

Mr. Wegner has written in part as follows: "While Saturn's rings were closed, there was a good opportunity to obtain latitude measures of the belts. On September 25, 1966 at 5^h U.T. I had the privilege of being able to take photographs of Saturn with the 60-inch F:60 McMath solar telescope. Several photos were taken on Kodak Royal-X pan film. The image was vignetted to improve definition, and the resulting exposure times were ten to fifteen seconds. The average equatorial diameter of Saturn's image was 8.0 mms. The ten best images were selected for latitude measurements.

"Each image was measured twice by reorienting it in a Gaertner plate measuring engine. Each measure in Table I is a mean of four settings. The plane of the rings was used for aligning the images in the engine....

"A question mark is placed after the North North Temperate Belt in the table because from the map of Saturn's belts in The Planet Saturn, from the diagram on page 125, it appears to be the North North Temperate Belt; but from latitudes given on page 428, which agree with mine, it is called the North Temperate Belt."

My only set of direct visual estimates of Saturnian latitudes within 20 days of these photographic measures fell on September 18, 1966 at 4^h57^m, U.T. I used a 12.5-inch reflector at 303X in seeing 3 to 5 (poor to fair) and transparency 6½ (very clear). On this date B equalled -1°.26, and B' was -1°.41. Latitudes were computed with Alexander's formulae and his oblateness ratio of 1.12.

Table II. Latitudes on Saturn from Direct Visual Estimates by Walter H. Haas. September 18, 1966. 4^h57^m, U.T.

Position	Ratio	Saturnicentric Latitude
N. edge N. Eq. Belt	+.26	+12°.2
S. edge N. Eq. Belt	+.13	+ 5.4
N. edge "Shadow Rings"	+.02	- 0.2
S. edge "Shadow Rings"	-.01	- 1.8
N. edge S. Eq. Belt N.	-.21	-12.1
S. edge S. Eq. Belt N.	-.27	-15.3
N. edge S. Eq. Belt S.	-.35	-19.7
S. edge S. Eq. Belt S.	-.42	-23.8

Finally, it may be well to compare all latitudinal positions common to the two sets. In doing so, I have assumed that the South Equatorial Belt on the photographs was a merging of the two components I recorded visually. The actual latitudes of the edges of the apparent shadow of the rings are given in parentheses in Table III following the observed values, with the interpretation that the shadow recorded by each observer on September 18 and 25 included a thin strip of the Ring C projection to the south of the edge of the shadow of Ring C. To allow a valid comparison, I recomputed the Wegner latitudes with an oblateness ratio of 1.12.

Table III. Comparison of Latitudes of Same Features on Saturn.

Position	Wegner	Haas
N. edge N. Eq. Belt	+18°.84	+12°.2
S. edge N. Eq. Belt	+11.06	+ 5.4
N. edge Shadow Ring A	+ 3.27 (+1.89)	- 0.2 (+1.76)
S. edge Ring C Proj.	- 3.31 (+0.23)	- 1.8 (+0.29)
N. edge S. Eq. Belt N.	-13.20	-12.1
S. edge S. Eq. Belt S.	-23.55	-23.8

In comparing the latitudes in Table III it must be appreciated that we have no assurance of identical true values on the two dates, both because latitudes may change with time and because different Saturnian longitudes must have been presented to the earth.

Some very tentative conclusions might be:

1. The visual observer-namely me-placed the North Equatorial Belt about 6 degrees too far south.

2. The "shadow of the rings" was much too broad on the photographs, indeed by a factor of almost four.

3. The agreement between the two methods for the latitudes of the edges of the South Equatorial Belt is surprisingly good.

Of course, there is no question that latitudes measured from good photographs must greatly surpass in accuracy simple visual estimates at the telescope. The comparison here discussed, however, would suggest that large numbers of visual estimates, which are quickly and easily made, can be of value in planetary studies.

AN APPARENT OBSERVATION OF COLOR IN THE ARISTARCHUS - HERODOTUS REGION

By: Charles L. Ricker, A.L.P.O. Lunar Recorder

Date: May 29, 1967, Universal Time.
Time: 6:40 to 7:25, U.T.
Observer: Carl A. Anderson, Manchester, New Hampshire.
Instrument: 10" F:6.8 Reflector. 16mm. and 8mm. Orthoscopic eyepieces. No filters.
Seeing: Above average; Transparency: Excellent.
Major Auroral Display during entire night.

Summary of Observation:
The observer was observing the Moon for the purpose of timing sunset in the craters Theophilus and Cyrillus. Upon completion of this effort, he turned the telescope on Aristarchus, and was honestly shocked at what he saw. Note Figure 5. The red-brown color was very strong. It was centered at xi - 685, eta + 390. The glow was strongest and covered the greatest area when first seen at 6:40, U.T. Gradually it decreased in area, but not in prominence, until reduced to about one-half its original size by 6:48. By 6:50 color was no longer seen, having faded gradually. At 6:58, color was seen again, but was not so pronounced. It was still red-brown. It faded out at 7:00 and was not observed again. The observation was terminated at 7:25, U.T.

The observer went to great pains to test the objectivity of this observation. Upon completion of the observation, he spent much time in checking extra-focal star images to test the alignment of his optics, and spent much time trying to make himself see color in other lunar formations, but without success. He had changed eyepieces during the observation to make sure that the color was not in the eyepiece. The observer honestly did not believe what he saw, and spent much time trying to make the color disappear.

Here is an observer with many years of experience, and with an established reputation. He has never even suspected color activity in the past, and was not looking for color activity when observing on this night.

Recorder's opinion: It is the opinion of the Recorder that this was an observation of a geniune color phenomenon, for the following reasons:
(a) The observer's reputation and experience.
(b) The fact that the telescope is a reflector of adequate aperture.
(c) The gross and evident nature of the phenomenon.
(d) The great and unusual effort to which the observer went to test the objectivity of the observation.
(e) The fact that the observation occurred at a time of major solar activity, as evidenced by major Auroral displays during this period, which have been reported by observers everywhere. Major solar flares were observed on May 23, 25, and 28. These were all a result of a very large sunspot group which crossed the central meridian on May 25, 1967.

Wordy Postscript by Editor. We commend Mr. Anderson on the great care which he exercised in making this observation and Mr. Ricker on the completeness and objectivity of this report. The procedures followed by the observer are worthy of imitation whenever lunar transient phenomena are seen or suspected.

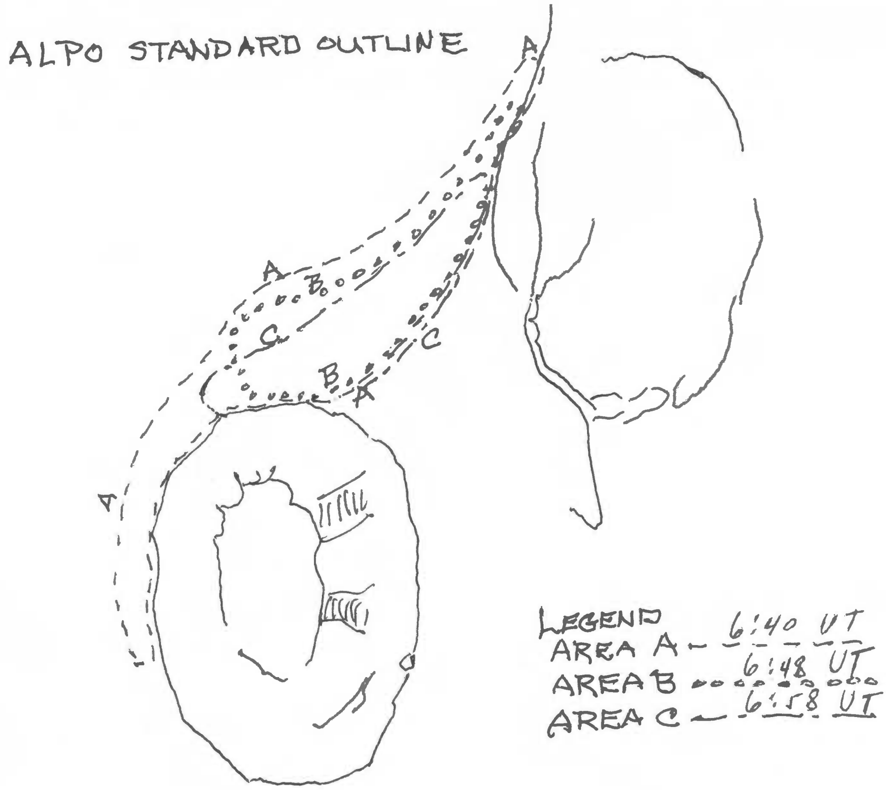


Figure 5. Diagram to show location and extent of color observed in Aristarchus-Herodotus region by Mr. Carl A. Anderson on May 29, 1967. See also Mr. Ricker's article beginning on page 135.

******

The Editor would suggest that atmospheric dispersion is a possible alternate explanation of the observation. The moon was low in the sky at Manchester while the color was seen; its approximate altitude above the horizon on May 29 was 12° at 6^h40^m, U.T., 15° at 7^h0^m, and 17° at 7^h25^m. Since Aristarchus is much brighter than the adjacent lunar surface, Aristarchus resembles a star in that at low lunar altitudes it becomes a vertical spectrum, violet at the upper end and red at the lower end. Now the colongitude was $153^{\circ}.2$ at 7^h, U.T.; the sun was thus 16 degrees past the local meridian of Aristarchus. At this high solar lighting the whole crater of Aristarchus is brilliant, and there is a very bright band running southwest (I.A.U. direction) from the south end of Aristarchus and approximately tangent to the south end of Herodotus (Figure 5). Thus this bright band lay, in the earth's sky, along the lower end of the generally brightened Aristarchus area while Mr. Anderson was observing, and red color at this position and on the south rim of Aristarchus (Figure 5) is precisely what terrestrial atmospheric dispersion would cause. Although the Editor is not prepared to say precisely what effect the increase in the Moon's altitude from 12° to 15° between 6^h40^m and 7^h0^m ought to have, it must in general cause reduced observed effects of atmospheric dispersion; and false colors from this source would necessarily be harder to see after 7^h0^m, during which later period the observer searched in vain. Again, Aristarchus is so much brighter than most other lunar features that false colors produced by atmospheric dispersion must be easier to detect there than almost anywhere else on the moon.

There is an instructive discussion of atmospheric dispersion with special reference to false colors on Jupiter in B. M. Peek's <u>The Planet Jupiter</u>, pp. 37-38.

Mr. Ricker agrees with the Editor that we need to consider atmospheric dispersion as a possible alternate explanation of Mr. Anderson's lunar transient phenomenon. The case for the alternate explanation will be weakened, of course, if Mr. Anderson and others are unable to repeat the observation described here at comparable lunar altitudes above the earth's horizon and at comparable solar illuminations of Aristarchus.

SOME OBSERVATIONS OF MARS IN 1961, 1963, AND 1965

By: Gary Wegner

Mr. Capen's fine Mars observations in Vol. 20, Nos. 1-2 of The Strolling Astronomer and the subsequent lack of other observations of such detail have tempted me to submit some of my own observations over the past three apparitions since the present is a time when observations are few and needed. See Figures 6, 7, 8, and 9.

The 1961 and 1963 sets of observations were made by myself chiefly at Bothell, Washington with a 10-inch f/18.4 Dall-Kirkham reflector. The 1961 observations shown were made on one night of excellent seeing and show about 1/3 of the planet. The 1963 apparition was by far the least favorable one as far as weather was concerned, but a few good views were secured. I am able to show one sketch made with the U. S. Naval 26-inch refractor at Washington, D.C. (Figure 7).

In 1965 Mr. Joseph Gardner and I studied Mars with the fine 12-inch f/15 refractor at Pullman, Washington, belonging to Washington State University. We made drawings on the same nights around opposition time, but did not compare our results until later. Some of our best drawings are shown (Figure 9). It is interesting to compare our observations and also Mr. Capen's, which are all quite independent.

The canals (linear markings) were clearly seen in 1961 and 1965, but were difficult in 1963. The terminator was searched for any irregularities, but none showed themselves except for possible dents when dark areas were on the terminator. The color changes were interesting as always. The most vivid change noted was between March 18 and April 18, 1965 when the area near Mare Acidalium at latitude 25° North, longitude 50° turned from blue-grey to noticeably brownish.

Changes noted in the south polar cap are interesting. In both 1961 and 1963 the reforming was observed. First, cloud formations appeared to be seen, for they changed from day to day; but later a bright spot appeared near the center of the cap and became a nucleus of the rejuvenated south polar cap.

Figure 6. Observations of Mars on January 2, 1961 at approximately 2 hour intervals, showing rotation of planet. Drawings by Gary Wegner with a 10-inch reflector at 368X. Seeing 7-8 (very good), transparency extremely good. Date is by Universal Time. C.M. = 295° for top drawing, 330° for middle drawing, and 6° for bottom drawing.

SEVENTEENTH ANNUAL MEETING OF THE MID-STATES REGION OF THE ASTRONOMICAL LEAGUE

By: Robert E. Cox

"Observing Programs for the Amateur Astronomer" was the theme of the 17th annual meeting of the Mid-States Region Convention at Wichita, Kansas on June 9, 10, and 11, 1967. The meeting was hosted by the local society and was held at Friends University; and in spite of inclement weather, heavy rain, strong winds, and tornado alerts, almost 100 persons registered for the various sessions.

Paper response was exceptionally good; and it

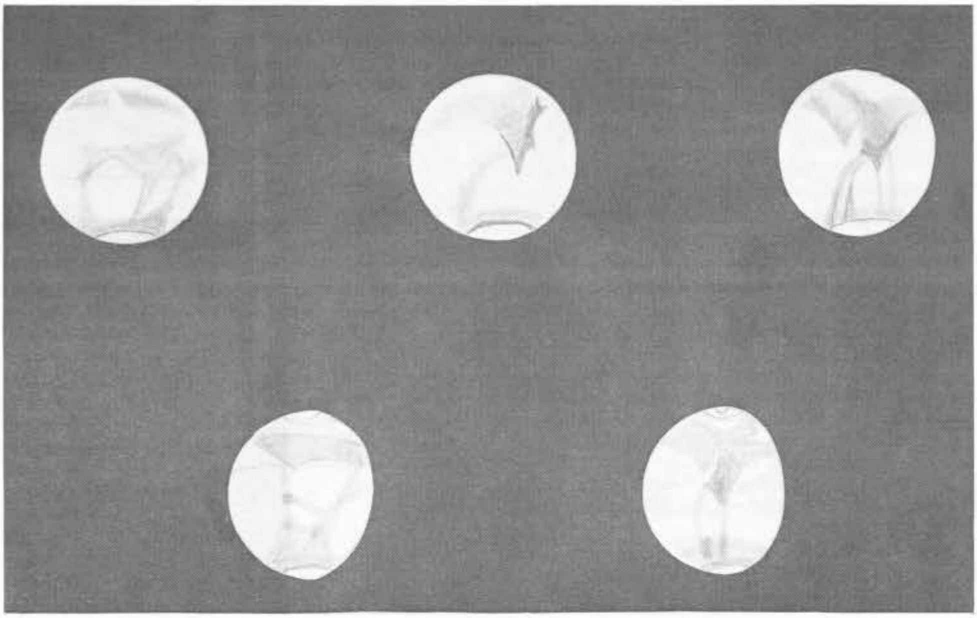


Figure 7. Drawings of Mars in 1963 by Gary Wegner. Upper line, left drawing. Feb. 11, $6^h 15^m$, U.T. 10-inch refl., 386X. Seeing 5, transparency extremely good. C.M. = 134°.

Upper line, center drawing. March 4, 7^h30^m, U.T. 26-inch refr., 350X (?). Seeing 7, transparency extremely good. C.M. = 327°.

Upper line, right drawing. March 7, 6^h3^m, U.T. 10-inch refl., 368X. Seeing 6, transparency extremely good. C.M. = 279°.

Lower line, left drawing. March 18, 6^h34^m, U.T. 10-inch refl., 368X. Seeing 5, slight haze. C.M. = 187°.

Lower line, right drawing. April 10, 4^h38^m, U.T. 10-inch refl., 368X. Seeing 6, sky hazy. C.M. = 306°.

******

was necessary to schedule several papers on Friday evening, June 9, something never before necessary. The presentations throughout the meetings followed the theme closely; and on the Friday program E. D. Tarbell of Laquey, Missouri spoke on "Tales of Tarbell Observatory and Planetarium" in opening the sessions. This installation was the first public planetarium and observatory to be opened for the public in Missouri, and the details of its formation and activities were most interesting. As are all such installations, it is a powerful tool for teaching the youngster and the general public about astronomy and observing. The President of the Central Missouri Amateur Astronomers, W. C. Olson, showed excellent short exposure color slides of well known constellations; and to close the evening activities W. C. "Bud" Shewmon, Secretary of the Central Missouri Amateur Astronomers, spoke on "The Front Yard Stars", which are those within five parsecs of the sun. A scheduled star party was dissolved by heavy precipitation.

Figure 8. Drawing of Mars on April 18, 1965 by Gary Wegner at 7^h15^m, U.T. 12-inch refr., 435X. Seeing 4, transparency 6.5. C.M. = 63°.

Saturday morning officially opened the meetings with welcome addresses by co-chairmen Russell Maag and Louie Hees, Friends University President Dr. Roy F. Ray, and Professor Kjersti Swanson, the President of the Wichita Society. The business meeting opened with a report by the Secretary-Treasurer, William Hain of the Kansas City Club; and a roll call of member societies showed Kansas City, St. Louis, and Wichita strongly represented with over a dozen delegates and with other societies and guests represented by fewer members. Astronomical League President Gene Tandy reported on the coming National Convention in Washington, D.C. over the July 4th, 1967, weekend and discussed League activities of interest and importance to the members.

Russell Maag presided at the morning paper session, introducing first Earl Moser, President of the Prairie Astrono-

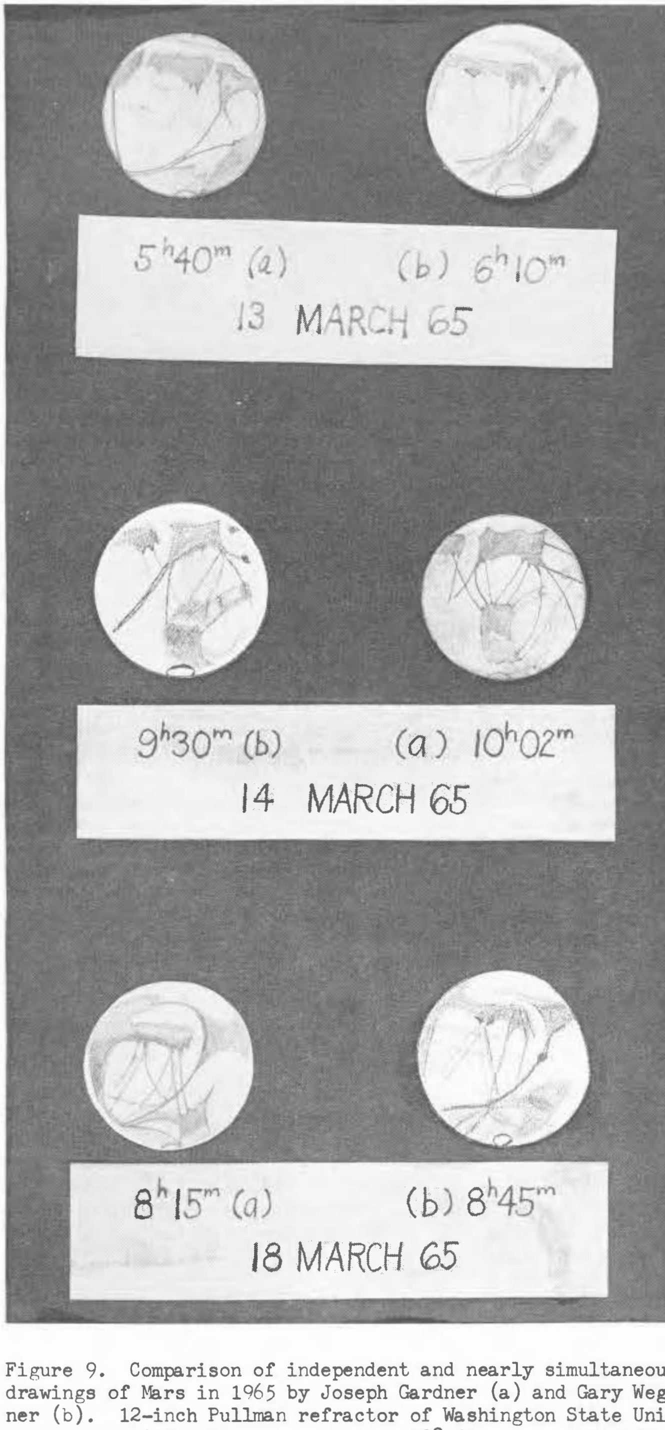


Figure 9. Comparison of independent and nearly simultaneous drawings of Mars in 1965 by Joseph Gardner (a) and Gary Wegner (b). 12-inch Pullman refractor of Washington State University at 435X. Approximate C.M. = 3° for upper pair of drawings, 50° for middle pair, and 357° for lower pair.

my Club of Lincoln, Nebraska, who discussed "Comets and Messier Objects--How to Find Them". He made suggestions for the beginner for easy observing of deep sky objects. Veteran AAVSO member Robert M. Adams of Neosho, Missouri then spoke on "The How of Making Variable Star Observations", discussing the various techniques one can use to make such observations and the assistance they are to the professional. Pictures of his equipment made many delegates wish that they had such a fine installation and such variety of equipment. Major Marvin Baldwin, Whiteman Airforce Base in Missouri, then discussed "Observing Eclipsing Binaries" and showed how the amateur can make such observations without photoelectric equipment, just by means of careful visual observations of the binary and the comparison stars in its neighborhood. Concluding the morning session, Professor Robert Johnson of Friends University discussed "Helium-Neon Gas Laser and Astronomical Applications" with a demonstration at the conclusion of his presentation.

The afternoon session was presided over by Mr. Maag, who introduced as the first speaker Robert E. Cox of Sky and Telescope magazine and a member of the St. Louis Astronomical Society. He spoke on "Ramblings for ATM's"--suggestions on telescope care, operation, performance, and how to get the most out of an instrument when making observations. "Reductions of Eclipsing Binary Light Curves" by Dr. Stanley Alexander, head of the Physics Department and Director of the Crane Observatory at Washburn University, Topeka, Kansas, explained to the audience how the observations made by amateurs and professionals are reduced to produce light curves and information on the physical properties of the star systems. Edwin F. Friton, Regional Director of the American Meteor Society and member of the St. Louis Astronomical Society, then spoke on "Meteoritics - Mid-States Region U.S.A.", describing several recent spectacular fireballs and his investigations and attempts to find fallen meteorites from these objects.

A field trip to the Sacred Heart College to visit their new Science Building and Planetarium was made later in the afternoon; and those attending, as guests of Sister M. Gertrude, enjoyed the demonstration of the 15-foot dome and Nova Planetarium projector.

Starting the evening activities was a drawing for door prizes, gifts provided by various firms active in the field of amateur astronomy. The featured speaker of the convention was Professor Walter H. Haas, Director of the Association of Lunar and Planetary Observers from Las Cruces, New Mexico. His subject was "The Janus Faces of Amateur Lunar and Planetary Observers", a very timely discussion of the role of the visual amateur observer in this day of space probes to our celestial neighbors. There is no necessity for the amateur to be discouraged and to abandon his work in observing just because we have scientific probes on the surface of the moon and orbiting it and other probes going to Venus and Mars. For many years to come the observations of the amateur will continue to be valuable to the professional. Astronomy is becoming more technical in its scope and equipment; and although this fact limits many amateurs, there will always be those who will devise accessories to keep pace with modern techniques and methods and thus continue to contribute valuable work, Mr. Haas pointed out.

The first Mid-States Regional Award for outstanding service to the field of amateur astronomy in the area was presented by Gene Tandy to Russell C. Maag, a decision warmly accepted by the delegates. Russ is known for his unceasing efforts to popularize amateur astronomy throughout the Midwest.

Because of continuing inclement weather, observing was cancelled; and several presentations were provided by attending amateurs to help fill out the evening program. Bob Sandy of the Kansas City Astronomy Club presented an illustrated talk on his eclipse expedition work and the observation of grazing occultations of stars by the moon.

The program came to a close on Sunday morning, June 11, with "Bud" Shewmon presiding. The first speaker was Edward Sion, a student at the University of Kansas and a member of the Wichita Astronomical Society, who discussed "Period Changes in Eclipsing Binaries". Earl Moser, who had presented a paper on Saturday morning, gave a demonstration and presentation on "Notes on Alignment of Polar Axes" and exhibited pictures to illustrate many hours of exposure without guiding with short focus lenses. It was obvious that his methods really work. The final paper was by Edwin Friton and concerned "Observations, History and Current Status of Nova Persei, 1901", Mr. Friton having the distinction of first catching a recent upsurge in light of this famous variable. Russell Maag announced the formation of a special committee to plan for scientific work by Mid-States members during the 1970 total solar eclipse, the last such event in this century in the continental United States.

New officers for the region for the coming year are: Edwin Friton, St. Louis Astronomical Society, Chairman; William C. Olson, Central Missouri Amateur Astronomers, Vice-Chairman; and William Hain, Kansas City Astronomy Club, Inc., Secretary-Treasuer. The St. Louis Astronomical Society will be the 1968 Convention Host.

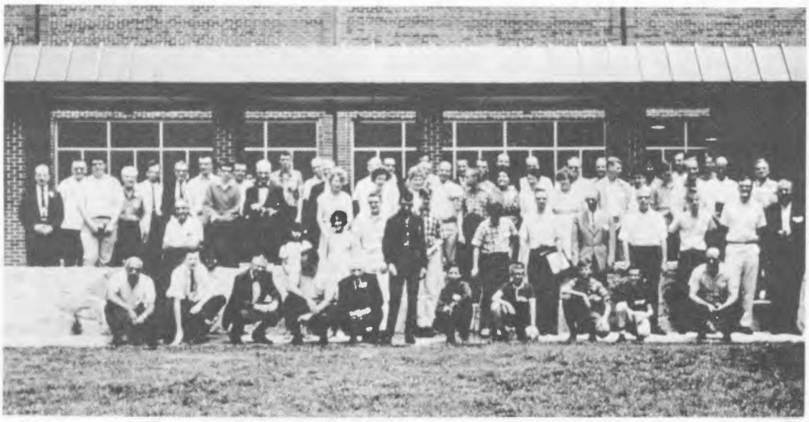


Figure 10. The Seventeenth Convention of the Mid-States Region of the Astronomical League at Friends University, Wichita, Kansas, June 9-11, 1967. Photograph by Mrs. Walter H. Haas. Copied for publication here by Mr. John Ledbetter.

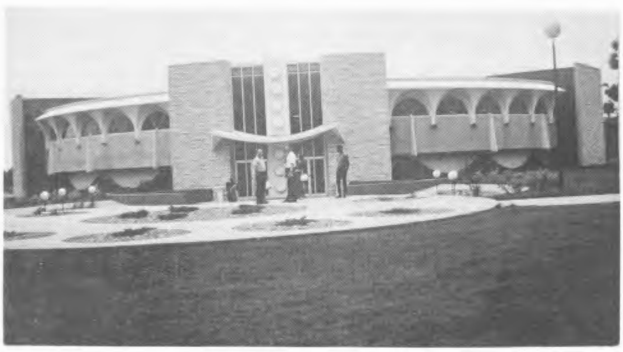


Figure 11. Sacred Heart College Science Hall and Planetarium, Wichita, Kansas. Figures 11, 12, and 13 are photographs supplied by Mr. Russell Maag.

Figure 12. Mr. Glen Chambers of Wichita, Kansas and 6-inch reflector of his own design at Mid-States Region Convention.

Figure 13. Dr. Kjersti Swanson, President of the Wichita Astronomical Society, the host for the Mid-States Region Convention.

ANNOUNCEMENTS

A Note from the Jupiter Recorder. Mr. Wend has recently written as follows: "The article 'Some Recent Observations of Jupiter' (Str. A., Vol. 20, Nos. 5-6) was not intended to be an all-inclusive report resulting from a complete search of the files of the Jupiter Section. Figure 20 on pg. 104 in that issue refers to a dark column in the STrZ of Jupiter as the 'discovery observation' of that object. Actually, this feature was seen by several other observers at about the same time. Mrs. Joanne Farrell and Kip Larkin of Binghamton, New York have called attention to their observations of this column, as has also Bill Moser of Connellsville, Pa."

In Memoriam. We announce with regret the death in August, 1967 of Mr. Kazuyoshi Komoda of Miyazaki City, Japan. He was the first man in Japan to make truly systematic observations of Jupiter, and he had long been the leading observer of the Jupiter-Saturn Section of the Oriental Astronomical Association. Though crippled by an attack of poliomyelitis when young, he overcame this physical handicap and even retained his interest in astronomy during his final illness. He was a member of the A.L.P.O. for a number of years, and several articles about his studies of Jupiter have appeared in past volumes of this journal. His drawings of features on the Giant Planet were remarkably reliable.

Mr. Komoda's death was caused by cancer. He is survived by his wife and grown children. This information here given has been supplied by Mr. Takeshi Sato, who also took the photograph appearing as Figure 14. We express our sympathy to the planetary observers in Japan in their loss.

Sustaining Members and Sponsors. As of September 13, 1967, we have in these special classes of members:

Sustaining Members - Sky Publishing Corporation, Charles F. Capen, Craig L. Johnson, Geoffrey Gaherty, Jr., Dale P. Cruikshank, Charles L. Ricker, Alan McClure, Elmer J. Reese, Carl A. Anderson, Gordon D. Hall, Michael McCants, William K. Hartmann, Ralph Scott, A. W. Mount, Charles B. Owens, Joseph P. Vitous, John E. Wilder, Clark R. Chapman, A. K. Parizek, B. Traucki, Charles H. Giffen, Frederick W. Jaeger, P. K. Sartory, Nicholas Waitkus, Patrick S. McIntosh, Lyle T. Johnson, the Chicago Astronomical Society, H. W. Kelsey, Phillip Wyman, Harry Grimsley, and Daniel H. Harris.

Sponsors - William O. Roberts, David P. Barcroft, Grace A. Fox, Philip and Virginia Glaser, John E. Westfall, Joel W. Goodman, the National Amateur Astronomers, Inc., James Q. Gant, Jr., Ken Thomson, Kenneth J. Delano, Richard E. Wend, and Phillip W. Budine.

Sustaining Members of the A.L.P.O. pay $10 per year; Sponsors, $25 per year. The surplus above the regular rate is used to support the work and activities of the Association.

In Memoriam. Mr. Clive Chapman of Sydney, Australia died some months ago. He had been a member of the A.L.P.O. since 1951. Though age and poor health had not allowed him to observe much in recent years, Mr. Chapman was most keenly interested in astronomy. He was a delightful correspondent on a wide variety of subjects - the Editor could regret only the difficulty of replying at proper length. His wife died a few years ago after a long illness.

New Assistant Jupiter Recorder. In the Jupiter Section Dr. Charles Giffen has been replaced as an Assistant Recorder by: Phillip W. Budine
102 Trafford Road
Binghamton, New York 13901

Dr. Giffen's services to our Association have been numerous, and his name will certainly be familiar to readers of this journal in recent years. Unfortunately, his professional duties with the Mathematics Department of the University of Virginia appear to leave him little time for Jupiter studies or for the reduction and publication of Jupiter material in his hands. We certainly appreciate his efforts for the A.L.P.O.

Mr. Budine has been a devoted and enthusiastic member for many years. He has already served, some years ago, as a Recorder in the Jupiter and Saturn Sections. He is the leader of an active group of lunar and planetary observers in Binghamton, New York. He has been recommended by several leading A.L.P.O. members to be an Assistant Jupiter Recorder. We welcome Mr. Budine to our staff and are glad to secure a person as experienced in Jupiter work as he is for this position.

The three Jupiter Recorders plan first to work up A.L.P.O. records on the 1966-7 apparition of Jupiter. They will then turn to the backlog of unpublished work on previous apparitions. These men are worthy of our support, and current observations of Jupiter must

Figure 14. Photograph of the late Japanese planetary observer, Kazuyoshi Komoda, 1915-1967. Taken by Mr. Takeshi Sato in December, 1966.

not lag. All Jupiter observations should be mailed to Mr. Wend, the A.L.P.O. Jupiter Recorder.

New A.L.P.O. Lunar Libration Cloud Section. The reasons for this new Section and an outline of its intended early work are described by its Recorder, Mr. Walter J. Krumm, in his article in this issue on pages 124-125. Mr. Krumm's address is NASA, Office of Advanced Research and Technology, Mission Analysis Division, Moffett Field, California 94035. A.L.P.O. members are heartily invited to participate in the work of this Section, particulary those who have skies of sufficient excellence or who are not active in other A.L.P.O. programs.

New Book in A.L.P.O. Library. We express our thanks to Mr. Samuel Gordon, Science Editor of the Washington Daily News, for his gift to the A.L.P.O. Library of the book Beyond the Observatory, by Dr. Harlow Shapley. The book is written in Dr. Shapley's usual lively, informative, and even challenging style of writing. We plan to review Beyond the Observatory soon in these pages, and we invite A.L.P.O. members to borrow it from our Library for some enjoyable reading.

LUNAR AND PLANETARY PROSPECTS, OCTOBER - NOVEMBER, 1967

Mercury. This planet will be at greatest elongation east, 25 degrees from the sun, on October 9 (U.T. date here and elsewhere). It will be at inferior conjunction on November 1 and at greatest elongation west, 19 degrees from the sun, on November 17. For observers in middle northern latitudes the September-October evening apparition of Mercury will be an unfavorable one because of the small tilt of the ecliptic to the horizon. The following November-December morning apparition will find the planet better placed in the sky. Reverend Hodgson, the Mercury Recorder, is eager to enroll all interested persons with suitable instrumentation into a systematic study of this challenging planet--he invites correspondence from such observers.

Venus. This planet will be the brilliant Morning Star throughout the autumn. Greatest elongation west occurs on November 9. Observations of the kinds indicated in recent Venus Reports in this journal are encouraged and are the more needed because of the normally poor coverage of morning apparitions.

Mars. Now distant from the earth, this planet will be low in the southwestern sky in the evening. The angular diameter will decrease from 6".4 on October 1 to 5".3 on November 30. The season will be spring in the southern hemisphere of Mars, and fairly large telescopes should reveal something of the "melt" phenomena of the south polar cap.

Jupiter. The Giant Planet passed conjunction with the sun on August 8, 1967 and is accordingly well placed in the morning sky during the autumn. There is the usual need for effective coverage of the early months of the present apparition. The Great Red Spot should be near longitude 30° by System II.

Saturn. The Ringed Planet reaches opposition on October 2 and is accordingly very well situated in the autumn evening skies. On the date of opposition the earth and the sun are each about 7 degrees to the south of the plane of the rings. The rings are hence opening again, and the southern hemisphere of the planet is displayed to better advantage than it has been for almost two decades.

Uranus and Neptune. Uranus is in conjunction with the sun on September 18 and is accordingly observable in the morning sky by late October. Its position is: November 1, right ascension 11 hrs., 51 mins., 38 secs., declination +1°42'; November 30, right ascension 11 hrs., 56 mins., 11 secs., declination +1°13'. Neptune is at conjunction on November 17 and is not likely to be observed in the evening sky long after the beginning of October. On October 1 its position is: right ascension 15 hrs., 22 mins., 0 secs., declination -16°45'.

Moon. There will be a total eclipse of the moon on October 18, 1967. The circumstances are as follows:

Moon enters penumbra	$7^h\ 9^m.8$, Universal Time
Moons enters umbra	8 25.4
Total eclipse begins	9 44.8
Middle of eclipse	10 15.2
Total eclipse ends	10 45.5
Moon leaves umbra	12 4.9
Moon leaves penumbra	13 20.5

The eclipse will be visible in some part all over the United States, but on the East Coast totality will occur with the moon low in the western sky, and the moon will set while still in the umbra. There are various possible programs of amateur studies of lunar eclipses, among them: (1) The timing of umbral contacts for lunar features, the observed times when they enter and leave the earth's umbral shadow. (2) The determination of the brightness of the eclipsed moon, perhaps most conveniently measured as its integrated stellar magnitude at different times during totality. (3) The careful examination of lunar features where changes have been reported (e.g., Aristarchus, Alphonsus, Linné) to determine possible changes in appearance caused by the shadow's passage. (4) Searches for the L4 and L5 Lunar Libration Clouds while the full moon is dimmed by the eclipse. (5) Photographic and visual observations of colors on the eclipsed moon.

Some years ago Lunar Recorder John E. Westfall had available for distribution some observing-forms useful in studying lunar eclipses. Interested persons might like to write to him to request such forms. Mr. Westfall's address is 1530 Kanawha St., Apt. 110, Adelphi, Maryland 20783.

A schedule of observations of Ross D. where a number of lunar transient phenomena have been recorded, is being set up by Mr. Daniel H. Harris, Steward Observatory, University of Arizona, Tucson Arizona. In the coming months observations of Ross D are especially desired at these U.T. dates and times: October 10, 2^h45^m; October 23, 7^h30^m; November 15, 4^h0^m; December 8, 2^h50^m; December 21, 9^h0^m. The participation of as many observers as possible, and especially of experienced lunar observers employing the larger apertures, is greatly desired. As those who attended the W.A.A.-A.L.P.O. Convention at Tucson will surely agree, the mere occurrence of lunar transient phenomena is still a highly controversial subject. Certainly the evidence about most reports of this kind during the last 4 years is unsatisfactory in various ways.

The Strolling Astronomer

SUBSCRIPTION RATES

Single Issue (in stock)	$1.00
6 Months	2.50
1 Year	4.00
2 Years.	7.00

SPECIAL MEMBERSHIPS

Sustaining Members	$10 per year
Sponsors	$25 per year

☆ ☆ ☆

ADVERTISING RATES

Full Page Display Ad..................	$40.00
Half Page Display Ad..................	22.50
Quarter Page Display Ad...........	15.00
Classified or Listing (per col. in.)	4.00

Discount of 10% on 3-time insertion.

☆ ☆ ☆

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

STAFF

EDITOR
Walter H. Haas
Box AZ
University Park, New Mexico 88001

SECRETARY
Atty. David P. Barcroft
Box AZ
University Park, New Mexico 88001

LIBRARIAN
Mrs. Walter H. Haas
2225 Thomas Drive
Las Cruces, New Mexico 88001

BOOK REVIEW EDITOR
J. Russell Smith
8930 Raven Drive
Waco, Texas 76710

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

MERCURY RECORDER
Richard G. Hodgson
Janacres
Colchester, Vermont 05446

VENUS RECORDER
Dale P. Cruikshank
Lunar and Planetary Laboratory
University of Arizona
Tucson, Arizona 85721

MARS RECORDER
Klaus R. Brasch
Dept. of Biology
Carleton University
Ottawa I, Ontario, Canada

ASSISTANT MARS RECORDER
Kenneth T. Chalk
3489 Grey Avenue
Montreal 28, Quebec, Canada

JUPITER RECORDER
Richard E. Wend
2050 N. Lawler Ave.
Chicago, Illinois 60639

ASSISTANT JUPITER RECORDERS
Paul K. Mackal
7014 W. Mequon Road
112 North
Mequon, Wisconsin 53092

Phillip W. Budine
102 Trafford Road
Binghamton, New York 13901

SATURN RECORDER
Thomas A. Cragg
Mount Wilson Observatory
Mount Wilson, California 91023

ASSISTANT SATURN RECORDER
Larry C. Bornhurst
165 Coral View
Monterey Park, California

URANUS-NEPTUNE RECORDER
Leonard B. Abbey
3204 La Vista Road
Decatur, Georgia 30033

COMETS RECORDER
Dennis Milon
Lunar and Planetary Laboratory
University of Arizona
Tucson, Arizona 85721

LUNAR RECORDERS
John E. Westfall
1530 Kanawha St., Apt. 110
Adelphi, Maryland 20783

Clark R. Chapman
(Lunar Training Program)
94 Harper
Buffalo 26, New York

Kenneth J. Delano
(Lunar Dome Survey)
22 Ingell St.
Taunton, Massachusetts

Charles L. Ricker
403 W. Park St.
Marquette, Michigan 49855

LUNAR LIBRATION CLOUD RECORDER
Walter J. Krumm
NASA, Office of Advanced Research and Technology
Mission Analysis Division
Moffett Field, California 94035