Fifteenth Anniversary Issue

The Strolling Astronomer

Founded In 1947

THE JOURNAL OF THE ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS

Volume 16, Numbers 3-4 **March-April, 1962**

Published April, 1962

Cover design drawn especially for this issue by Mr. Edgar M. Paulton, Chairman Emeritus of the Observing Group, Amateur Astronomers Association, New York City.

THE STROLLING ASTRONOMER

Pan American College Observatory
Edinburg, Texas

Phone DU 3-3891, Ext. 71 (Office)
DU 3-4357 (Residence)

IN THIS ISSUE

THE MOON AS A LABORATORY FOR BASIC SCIENTIFIC RESEARCH

By: Dinsmore Alter

A few months ago the President of the United States proposed an expansion of our experimental program which leads toward the landing of men on the moon and their safe return. Unofficial sources speak generally of this voyage as being undertaken by a party of three men (perhaps of three women to conserve mass of the payload). The reason, most commonly stated in our newspapers, for the acceleration of our program, is the propaganda value to be secured, either through winning over the Russians in the race to space or, at the very least, of not being outdistanced by them. The cost of the project, especially under the augmented time scale, is tremendous and the question of value versus cost has been discussed often. A reasonable conclusion would appear to be that even if the competition in national propaganda were the whole of the story, it truly would be worth spending much to win. However, the extreme sums which are necessary are greater than could be the value to be received from propaganda effects alone.

A second possible value, which has been much discussed, concerns the military value of a lunar base. Artificial satellites which can photograph the surface of the earth in great detail certainly do possess much value as gatherers of data which can be processed for military intelligence. Indeed, we can make a fairly safe guess that no large nation will dare to neglect the use of them. Such satellites, if manned, will be either close enough to the earth that the radiation of the inner van Allen belt will not be too severe; or else they will be far enough away to escape serious difficulty from the outer van Allen belt. Satellites which revolve in the inner orbits may be thought of as developments from our present weather satellites. They may be, say, 600 miles above the surface of the earth with sufficient booster-rocket power to compensate for the tiny friction between them and the upper atmosphere. Such satellites would be vulnerable to enemy attack. At these short distances from the surface, especially through use of the maser, they could be used in guidance of rockets which were fired from one part of the earth to land at any other part. This would be true whether the payloads were atomic warheads or were commercial products to be delivered with "Buck Rogers" speed to customers far away from their source. These satellites would have much military usefulness.

The idea of using them to "drop" bombs on the earth is one to be considered seriously only by persons who have not passed a beginning college course in physics.

If we should place such "spaceships" in orbits outside the main part of the outer van Allen belt, their distances from the surface of the earth would be, say, forty times those of the inner satellites we have been considering. If the same cameras were to be used, the scale of the pictures they would make of the terrestrial surface would be lessened by that same ratio. A single second of arc would span about 500 feet. The desired fine, surface detail would be difficult to secure. A lens with a four and a half inch diameter would have a "circle of confusion" equal to this distance. It would require a very large lens, or mirror, to reduce this confusion area to fifty feet, even if we should neglect the effects of the troublesome terrestrial atmosphere. Inner satellites would possess a far greater advantage from this point of view. The outer satellites would also suffer a serious, though not necessarily fatal, disadvantage in their use for guidance of terrestrial rockets. It would require nearly a quarter of a second for radio signals to travel from the earth to them and back. Balanced against this handicap is the fact that nearly half the surface of the earth would be visible at one time. One hundred and seventy degrees of longitude and of latitude would be turned toward the satellite. Some of the visible area would be too much distorted by foreshortening to assist in rocket guidance, but the useable area probably would extend for a third of the way around the earth. The development of such vessels is a legitimate and important military objective.

The moon is about ten times as far away as the outer band of satellites would be. The scale of pictures secured from its surface, therefore, would be only a tenth that from the same cameras used at one of the outer satellites. Our best pictures of the lunar surface, as observed from the earth, barely reveal the existence of an object a quarter of a mile in diameter unless the albedo difference between it and the surrounding area is unusually large. The builders of military bases minimize that difference, and therefore such targets must be much larger for visual observation. Sensors which depend on heat radiation, etc., do not suffer from this linear limitation. They depend on the intensity of the signal, not on the area from which received. However, the intensity decreases by the same inverse square law as does the area. The signal caused by a rocket launching, as received at the moon, would have only a hundredth the strength it would have if monitored by a satellite which was ten times closer to the earth. A satellite inside the van Allen belts would receive it with roughly 160,000 times its intensity at the lunar distance.

The moon would be quite unsatisfactory for either destruction or guidance of a terrestrial rocket during the early part of its trajectory because of the more than two and a half second round trip time lag. It could be used for the later part of the path but less satisfactorily than a closer satellite. It would appear that the moon itself can have practically no advantage militarily, unless we permit our minds to join the armadas, fighting in space, which have entranced most of us as we have read their sagas late at night. However, the developments of the lunar program probably will push the success of a valid military program more rapidly than it would progress if the latter were our only aim. In accomplishing this, the lunar program would justify large national appropriations even though it had no public advantages of its own.

The third reason for undertaking the lunar program is the old, often quoted one that "the moon is there." This is the reason which has led explorers to the terrestrial poles, to the summits of the highest mountains, to small islands of the oceans, and to underwater explorations. It has given romantic sounding achievements which have thrilled all of the literate population of the world. It has stirred people to desire to accomplish more than the mere humdrum work of earning a living. We have grown because of its emotional urge. It is much more important even than this, because it is the chief factor which drives man to the basic research which improves our picture of the universe and which, less importantly, has resulted indirectly in all the gadgets which can give pleasure and security to modern man.

None of these reasons, although each is a valid one, comes to grips with the problem which causes the exploration and use of the moon to be, perhaps, the most important single task which the race ever has undertaken. The indirect results which have accrued from basic research are the subjects of nearly all the advertisements produced by "Madison Avenue". Unfortunately such gadgetry comprises almost the whole of life for many men. The applied results are, however, one valuable factor for all the rest of us. Indirect results from basic research have provided us with those technologies of medicine, of engineering, and of geodetics which have given the race its opportunity to accomplish many worth-while things. They have provided a salutary circle with basic research, which partnership is increasing the pace of our accomplishments at an explosive rate. There will be unbelievable advantages in opportunities for basic research resulting to all the physical sciences, and probably to the biological branches as well, from proper use of the moon. The main thesis of this paper is a very sketchy abstract of what can result to the race from use of the moon solely as a laboratory for basic, scientific research. This includes, of course, all of the technological activities which are necessary to support both the research itself and the people who perform it. In this is found the most cogent reason for pushing the endeavor in every way that it can be done.

There is not sufficient space here to discuss the conditions which man will find on the lunar surface. Their story has been told in many places. It is sufficient to state that the maximum technological ingenuity of the race will be taxed by the mere endeavor to keep alive on the moon and in such a condition that work can be carried out efficiently. We know most of the environmental handicaps and already can plan to overcome them. The handicap which is least known is that caused by the rather recently discovered high speed particles from the sun. If we were to consider the quality and density of the lunar atmosphere from our knowledge of the laws of gases, without introduction of complicating factors, we would estimate the density to be, perhaps, a ten thousandth of our own at sea level. We have measured it by use of radar and find that it is only a ten trillionth as dense, which is a much higher vacuum than man can produce in his laboratories. It appears to be certain that the discrepancy has been caused by the high speed solar particles which have stripped almost all gases from the lunar surface. Certainly the particles will trouble us. However, we can, legitimately, expect man to surmount the difficulties which they impose. This little discussion of the use of the moon is based on the assumption that he succeeds.

The geologist will have a world to study, on which there has been neither wind nor rain to produce erosion. It is one on which the effects of cosmic rays and solar particles will be more clearly visible than at the bottom of our "ocean of air." The physicist will need no walls for his particle accelerators. He will have a much better vacuum in which to work than he can have here. His synchrocyclotrons and linear accelerators can be built to tremendous size and without some of the complications which bother him on the earth. It may be possible that by using them he will begin to glimpse the detailed structure of even the subatomic particles. Perhaps also he may get a tiny glimpse at the ontological problems.

We can think of a lot of things which the biologist may desire to do. Nevertheless, it is better that we give him a description of the conditions which he will find on the moon's surface and let him tell us what he plans to accomplish.

It is, however, the astronomer whom we, logically, can expect to be the chief gainer. The advantages which the moon offers to him are of two families: technical circumstances and superior quality of data secured. There are numerous items in each category, and they will be listed in semi-tabular order.

A partial list of the technical comparisons:

(a) On the earth a large mirror, or a lens, sags because of its weight. This distorts the images. We have been able to prevent serious sagging of mirrors up to and including the 200" at Palomar Mountain. However, for our largest telescopes success has come only through use of complicated lever systems in the cells. On the moon, with a weight only a sixth the terrestrial one, such mirrors will not require elaborate protection against sagging.

(b) The weight potential here forces the use of a much greater mass in the mounting to secure the necessary rigidity than will be necessary at the lunar observatory. Much more complicated bearings must be used on the earth than on the moon.

(c) Expensive domes are necessary to protect terrestrial telescopes from wind and rain. On the moon a light screen probably will be necessary to protect against direct solar radiation and, perhaps, against micrometeorites when the telescope is not in use, but that is all.

(d) There will be less corrosive action on the aluminized surfaces of our mirrors than there is here. The damage from micrometeoritic etching should not be too difficult to reduce to less seriousness than that of atmospheric corrosion at our earthly observatories. A thin metallic tube can be extended out toward the principal focus to stop all such particles, except those from a small angular area of the sky.

(e) Motors necessary to move the telescope will be smaller.

(f) There will be no vibration from wind.

(g) The astronomer will know in advance exactly the conditions under which he will work at any future time. He can plan his schedule as far ahead as he may desire.

(h) There will be no troublesome illumination of the sky by the lights of some large city a hundred miles away. The natural luminescence of the sky will be many times less than it is here. Our air is slightly luminescent. Also it reflects moonlight sufficiently to bar certain types of observations when the moon is above the horizon.

(i) A large telescope can be used as efficiently as a small one. Our air distorts images from large telescopes so badly that often the mirror must be "stopped down." There is no reason except cost against the construction of a 1,000-inch reflector and its continual use at full aperture.

(j) The slow rotation of the moon and the lack of differential refraction between the zenith and the horizon will make almost perfect guidance a much simpler matter than it is here. When we consider exposures hundreds of hours long, using large telescopes either for direct photography or to obtain spectra of high resolution, we begin to appreciate what we shall gain from use of the moon.

The preceding list concerns merely the practical, observational advantages which are important only because they lead to our securing incredibly better astronomical data. Some of these better data are:

(a) The scale of distance which we use for the observable universe depends fundamentally on measurements which, in principle, are identical with the triangulation of the surveyor. We measure the parallactic displacement of certain asteroid and from the results calculate, through use of Kepler's harmonic law, the distances of the sun and of all of the planets. Probably for planetary distances we shall soon substitute radar measures of distance. However, the distances of even the nearest stars still will be determined by such primary triangulation, which uses the diameter of the earth's orbit as a baseline. The largest measured total displacement for a star has been $1''.52$, a very small angle. To these direct measurements made of the nearest stars we apply statistical and other theoretical means to obtain the distances of more remote objects. The earth's atmosphere causes large uncertainties in the parallaxes of even the nearest stars and consequent uncertainties in the theoretical distances of the farther objects. The almost perfect stellar images which we shall secure at the moon will increase our accuracy by fully one order.

(b) The increase in accuracy of measurements of parallax should give good results for, say, ten times the present distance. This gives us 1,000 times as many stars as a sample. The study of the nature of subdwarf stars is very important in hypotheses of stellar evolution. Because of their low luminosity, our observed sample has been much too small to give us certain important information.

(c) Nearly half of the light from a star is lost in passage through our atmosphere. In addition to this, the lack of blackness of our sky fogs the plates before we can secure measurable images of the faintest objects. On the moon we shall carry our observations to much fainter objects than we can from here.

(d) Lack of contrast is, perhaps, the chief difficulty in observing the most distant of the galaxies. At present the limiting distance is an estimated two billion light years. If man ever is to understand his universe he must know what the conditions are at far greater distances than he does today. Long photographic exposures in the blacker lunar sky should carry our data much farther out than is now possible. From the earth our plates would be fogged much too soon to permit any great gain over results already known. Is space limitless? Does it curve back on itself? Did the universe come into existence only, say, a dozen billion years ago, so that there still is empty space if we go far enough? Is the universe in a "steady state" without beginning or end? These are ontological questions, toward the answers of which we desire to secure every possible clue. It is possible that we never shall get the answers but we must keep on trying. Perhaps the equivalent of our 200-inch telescope, if used on the moon, would give us a thousand times as large a sample and through it provide some hint about the answers.

(e) From the moon, with such a telescope as the 200-inch, the actual disks of the nearest of the supergiant stars should just begin to be visible. Our atmosphere always will prevent any such observation from the earth.

(f) The laws of optics produce an area of confusion around the image of a point. This is true even for the case of perfect optics and light paths which lie entirely in vacua. For a one-inch telescope the confused diameter is 4".5, which covers an area of about 700 miles diameter on Mars even when it is closest. Under the same conditions a 10-inch telescope would reduce this area to 70 miles, and a 100-inch would leave a blurred residual of only 7 miles. If albedo differences were sufficient this would provide observations of what truly could be called fine detail. Because of atmospheric conditions we cannot even approach this resolution from the earth. From the moon we shall approximate it closely. (Probably Mars is not a good example to choose, because it seems probable that long before very large instruments have been installed on the moon, our probes will have sent back more detailed pictures.)

(g) Our observations of the constituent gases of the Martian atmosphere are very difficult to make from the earth because of the fact that the same ones exist in greater densities in the terrestrial atmosphere. Spectrographs in rockets and artificial satellites will give much of the answer but high dispersion spectrographs are, probably, too massive for such installations.

(h) Our high dispersion lunar spectrographs can be used to investigate the ultraviolet spectra of the stars and thus lead to more accurate classification according to physical characteristics.

(i) From the moon we shall be able to obtain detailed spectra of some of the lowest luminosity subdwarfs and learn much additionally about their nature.

(j) With the sharper, and smaller, stellar images we shall be able to separate many double stars which now can be observed only as single. With the better measures of their distances apart, we shall obtain better orbits for them and probably shall gain a bit more information toward solving the problem of their evolution.

(k) We shall, for the first time, get truly accurate measures of the apparent brightnesses of stars and of the variations of these brightnesses. Changes in the transparency of our atmosphere produce irregular errors in determinations made from the earth.

(l) The long lunar nights will make it possible to follow many of the variable stars continuously throughout their cycles. It is possible that, except for interference from the solar corona, we shall be able to continue the observations during the day.

(m) The corona of the sun can be followed outward in exquisite detail, probably beyond the orbit of the earth. The observations will require only the simplest of coronagraphs. The corona will be studied by radio waves, infrared ones, all bands of visible light, and by ultraviolet light, even down through the X-rays.

(n) The changes in coronal streamers can be followed for days at a time. This will be an especially important thing to do at times of solar flares.

(o) Finer structure of the "rice grains" of the solar photosphere will be observed and the detailed patterns of their changes will be followed.

(p) We shall not be bothered by atmospheric cutoffs in the radio wave spectral regions.

(q) We shall obtain detailed spectra from galaxies which are so far away that their light has required hundreds of millions of years, perhaps longer, to reach us. This observation will be limited only by a too large Doppler effect. Have our cosmological constants varied? It is possible that we shall receive part of the answer at our lunar observatories.

(r) It seems to be very probable that the solar radiation to which our atmosphere is opaque affects our weather more than does that which passes through easily. We can expect detailed study of this radiation and its variations to aid our meteorological research.

(s) In our galaxy there are great clouds of gas and dust of low enough density that some starlight does pass through them to us from stars which are beyond. Lunar observations will multiply the volume and quality of such observations.

(t) Our knowledge of space conditions in the Solar System and of their effects on meteorites will jump suddenly.

These twenty advantages are merely a few from the long list which the astronomer will secure to aid in his attempt to do his share in our study of the nature of the universe. Even his first, small observatories will give him data which it would be impossible to secure from terrestrial observatories, no matter how big. Instead of, perhaps, 5% telescopic efficiency as is the case here, his work will be done with fully 95% efficiency.

For those of us who believe that the race has an important function to perform in the evolution of the universe, the present opportunity seems to be the critical one. We can go ahead to the destiny for which we exist, or we can lean back lazily and pretend to ourselves that there is little to do. The amateur, lunar student can help very much by using every means at his command to insure that his community knows the importance of the present endeavor. Scientific progress has reached the point where we are walking a tightrope between possibilities of complete destruction and of a grandeur too great to be found even in our dreams. It is "up to us." THE GREAT MOMENT OF DECISION IS HERE. OUR LABORATORY IS ONLY A QUARTER OF A MILLION MILES AWAY. WE MUST BE CAREFUL THAT NO ONE USES IT FOR ANY OTHER PURPOSE.

<u>Postscript by Editor</u>. The preceding article was contributed by Dr. Alter upon request for this Fifteenth Anniversary Issue. Dr. Alter is the Director Emeritus of the Griffith Observatory and Planetarium in Los Angeles. He has assisted the A.L.P.O. in various ways over the years and has given several Morrison Lectures at A.L.P.O. Conventions in California.

LUNAR AND PLANETARY OBSERVING: THE RÔLE OF THE AMATEUR

By: Patrick Moore, F.R.A.S.

Fifteen years ago the A.L.P.O. was born. As one of its more geographically remote members, I am honored to be invited to contribute to this anniversary issue; and I have chosen a subject which is bound to be important to us all--all of us, that is to say, who are amateurs, which includes most of the A.L.P.O membership.

It is, I think, fair to say that until the last decade or so, professional astronomers tended to neglect physical observations of the Moon and planets. This was quite understandable, and even logical. Professional work is concerned with the really important matters, and we cannot claim that our Solar System is of the slightest importance in the cosmos as a whole. Moreover, the world's large telescopes are built for stellar studies, and it would be unwise to divert them to research which may be carried out adequately with smaller instruments. Lastly, there are not enough professional astronomers, with first-class equipment, to do everything. This is why the amateur had so pronounced a rôle to play.

Even now, when space research is under way and the first manned voyage to the Moon looms ahead, the amateur still has a rôle. It is rather more limited than it used to be; there is not much point in using, say, a 3-inch refractor to draw lunar features which are recorded in detail photographically. Yet the work of the amateur is as important as it ever was; the vital point is to direct it into the proper channels--and this, I feel, is where some improvement in world organization is called for.

Amateur work with regard to physical studies of the bodies in the Solar System is largely confined to the Moon and the planets Venus, Mars, Jupiter, and Saturn. Mercury needs a large aperture--I consider my own 12½-inch reflector quite inadequate--and while something useful may be done with regard to the variations in brilliancy of Uranus, surface details are beyond most amateur telescopes. (Occultation timings are still valuable; so are studies of comets, meteors, and artificial satellites--but I do not propose to deal with these branches in the present short paper.)

It would be quite wrong to suppose that the photographic charts of the Moon are exhaustive. They are not. In my view the small photographic atlas compiled by the Japanese observers Miyamoto and Matsui is quite outstanding, but direct observation with a moderate telescope can add to the details shown in it. The Kuiper Atlas is, of course, a major contribution; but many of the plates are not sharp enough for measurement of the fine features, and the limb regions are not shown clearly enough for precise charts to be drawn up from them. So the amateur with a moderate telescope retains a rich field--particularly if he concentrates on some specific classes of lunar features. There seems, too, to be a research program available in measuring the shadows inside craters to obtain better depth-estimates. Moreover, the amateur is relied upon to watch the various areas which are suspected of minor variation. This is work which the professional has no time to undertake.

Visual observations of Venus are difficult, and all attempts to clear up the vexed problem of the rotation period by visual work have met with failure; but the periodicity of the cusp-caps is promising, and only long-continued studies can confirm or deny the value of such work. There is, too, the "Schröter effect" or phase-discrepancy, where precise micrometrical measures are urgently needed. Careful studies of the Ashen Light are equally necessary.

Jupiter is, of course, probably the most rewarding of the planets from the amateur's point of view, and much of our knowledge of the surface is due to amateur work. A night can never be dull when Jupiter is above the horizon! Saturn is obviously more difficult--but remember that the last of the really important outbreaks, the white spot of 1933, was discovered by an amateur, W. T. Hay. I do not propose to say anything about Mars, since it is a planet which I have never observed really seriously except during the last three apparitions, but it is evident that the amateur is the best source of cloud observations and associated phenomena.

These comments are not new; every A.L.P.O. observer must have heard them many times, and I feel I should apologize for repeating them. But I am leading up to my main point--which is that the amateur work so far is not correlated so well as it might be.

There are a few societies which have pioneered the way. In Britain, the British Astronomical Association, formed in 1890, has a long and honorable record of observational work--I need only point to the work of the Jupiter Section and to the lunar reports and memoirs. Up to the time of the A.L.P.O. there was nothing really comparable in America, and this is why the A.L.P.O. has proved to be so important; it has gathered the amateurs together, and presented their work in a way which has been of the utmost value to astronomical science. Other countries, too, have their amateur societies, and produce reports which are of great interest.

The real trouble is that, in my view, the national societies do not have sufficient contact with each other. To give one example: both the B.A.A. and the A.L.P.O. have lunar sections, but there is no direct contact between the two. What contact there is depends solely upon a handful of observers who, such as myself, belong to both bodies. Unless a B.A.A. member takes The Strolling Astronomer he will not hear of the A.L.P.O. lunar work. And on an allied subject, how many A.L.P.O. members have come across the recent lunar papers by B. Warner published in the B.A.A. Journal?

In the past, it was a common fault for amateurs to direct their energies in the wrong direction: there were many people who would make pretty drawings of Jupiter, but only a few who were prepared to do the hard grind of staying outside for hours timing surface-transits. This is no longer the case, and the credit here is due to societies such as the A.L.P.O., where the sections are controlled by skilled directors who lay down their programs and analyze the results. (Let me add that as a pure amateur myself I have made probably more mistakes than most people--and I still do, even though I pretend that I am aware of the pitfalls.) So progress has been made on a national basis--but it is a national basis, not an international one.

Professional astronomy has the I.A.U., which produces publications and holds annual meetings in various countries. In the amateur world matters are more difficult, because few amateurs have the money to travel to conferences abroad, and sponsorship is generally out of the question. Yet I do not think that the difficulties are insuperable, and I would like the A.L.P.O. to take the lead in the formation of the I.U.A.A.--the International Union of Amateur Astronomers. It would at least be practicable to produce a periodical which would in no way cut across national journals such as The Strolling Astronomer, but which would be devoted to summarizing and correlating the work published, in more detail, elsewhere.

The advantage of such a scheme would be that it would improve the co-operation between amateurs in different countries without in any way affecting the national societies themselves. It seems a logical next step; and, provided that the various national societies were in agreement, it would work--in spite of the obvious difficulties, financial, linguistic, and otherwise.

This may seem something of a pipe dream, but there are many of us who are more than anxious to see amateur astronomy well-directed, organized, and correlated on an international basis. If a lead is to be given, I feel that it must come from the A.L.P.O., which has a deserved reputation of being energetic, skillful, and always ready to consider new ideas.

As one who, unfortunately, knows only a very few of you personally, it may seem out of place for me to put forward so bold a scheme; but I do not regret having done so--if it comes to nothing, there is no harm done. Meanwhile I would like to add my congratulations to you all upon your work during the past fifteen years, and I may perhaps also add to the many congratulations which must have been received by the man who was mainly responsible for the impetus--Professor W. H. Haas.

The first fifteen years of the A.L.P.O.'s existence have been fruitful indeed. I believe that the next two decades may be even more rewarding. I suppose I am fairly typical of the many amateurs who have no claims to academic distinction and who work with modest equipment; but I know that our work is well worth-while--and without societies such as the A.L.P.O., its value would be drastically reduced.

THE SHIFTING SAND[1]

By: L. J. Robinson

I don't know how many of you have ever experienced a desert wind storm; but if you had, you would have seen how the wind-blown sand covers and uncovers all which is in its path. How unrecognizable the appearance of the terrain becomes; how quickly heretofore unseen things greet the watchful eye; how quickly familiar objects disappear to those who dare to blink! Such is the truism of modern society in general, and of modern science in particular. To carry our allegorical analogy one step further--to amateur astronomy--we may say that the amateur astronomy of today is the underlying stratum, professional astronomy the sand, and scientific thought the storm. Like it or not, our avocation is under constant revision, and like a hapless Brünnhilde must meet its obligations or suffer the wrath of our Wotan, obsolescence.

Such a statement should neither give us concern about our value to astronomy in future years, nor should it cause a negative reflection on past efforts. One only needs to refer to such statements as:

"More and more this branch [physical observations of planetary surfaces] of planetary work, including the study of the Moon, became the topic par excellence of amateurs--who did remarkably well with it."[2]

"This map [Mars 1954] was made by the Association of Lunar and Planetary Observers, an amateur organization, but I find it quite useful."[3]

"I'm convinced that much that still needs to be done in lunar mapping can be done from presently available photographs and from direct visual observations with existing telescopes."[4]

"There are, however, many other fields in which the cooperation of amateurs would be invaluable. We discussed one of those yesterday afternoon, namely, the possibility of monitoring for such luminescence phenomena as Kozyrev observed..."[5]

It is at once seen that amateurs have performed valuable survey work in years past. But is this what is expected (or desired) of them in the future?

To a great extent, I believe that the answer is yes. The amateur has always been, and should continue to be, the "monitor" of the skies--he is best equipped for that task. But as both Kuiper and Kopal infer, there are two kinds of monitorial services: the undirected or survey service, and the directed or specific objective service. Up to the present time, the amateur has mostly been concerned with the former; but again we ask ourselves, "Is this the correct course to steer in the future?" I believe that a quick look at contemporary professional thinking will give us the answer.

As we all know, the space program has created a dire need for exact knowledge of the lunar and planetary topography, sub-surface conditions, and atmospheric constituents. Therefore, the professional astronomers have been called upon to supply this information; hence, great efforts are currently being made in these directions. The USAF-ACIC lunar maps, the Kuiper Lunar Atlas, and the de Vaucouleuers Mars map all bear out this statement. The most interesting aspect of the above research projects is that they are all fundamental in nature, bringing planetary cartography to the same degree of precision as was found in stellar "cartography" with the publication of the Bonner Durchmusterung in 1863. It is indicated, therefore, that the survey service era of amateur astronomy is drawing to a close. The complete supersedure of amateur efforts in this direction by professionals may require another decade, but sooner or later the inexorable transition will occur. The contemporary amateur would do well, therefore, to begin his transition into the second form of service--one which will not become outmoded until man walks upon the planets themselves. Today, it would be best if this form of amateur study were incorporated into the general survey program, either as independent observer endeavors or as cooperative efforts under the direction of the Section Recorder.

What are some specific projects suitable for amateurs? To list a few:

1) The rotation of Saturn at different latitudes.
2) The variation in brightness (?) of Uranus. E.
3) The variation in brightness (?) of Neptune. E.
4) The correlation of planetary radio emission with visual sources.
5) Three color photographic or photoelectric observations of lunar and planetary surfaces. E.
6) Comet hunting.
7) Study of the nature of Jupiter's Equatorial Band.
8) Lunar limb cartography.
9) Determination of fundamental quantities of lunar features, i.e., distribution, number, diameter, height, depth, and position.
10) Photometry of planetary satellites for variations in magnitude. E.

And these are just a few of the possible amateur projects. Most of them can be done by amateurs with no special training or equipment; a few (which I have marked with an "E" to denote "exotic") would require advanced training or equipment. But even these are within the scope of the advanced amateur.

In conclusion, the amateur must not only be aware of the professionals' needs and desires, but must continually re-evaluate his program to meet these wants. In this day of rapid and drastic astronomical developments, a once useful program may soon become shopworn or obsolete. The place of amateur astronomy is a supplemental one. It must exist where needed if it is to be of value. So long as the amateur recognizes his position and, at the same time, appreciates the position of the professional, so shall he always have a welcome and valued place in fundamental astronomical research.

I should like to take this moment to thank Professor Haas for the opportunity to express the foregoing views in this Fifteenth Anniversary Issue, which in itself speaks highly for amateur lunar and planetary astronomy, and is deserving of hearty congratulations from us all.

References

(1) This paper is adapted from a lecture given by the writer to the J.A.C. of New York City. It was tape-recorded by Mr. A. E. Pearlmutter, to whom this author is deeply in debt.

(2) Kuiper and Middlehurst (Editors), Planets and Satellites, University of Chicago Press. Chicago, 1961, p. vi.

(3) R. S. Richardson, "Proceedings," Lunar and Planetary Exploration Colloquium, October 29, 1958, Vol. 1, No. 3, p. 19.

(4) E. M. Shoemaker, "Proceedings," Lunar and Planetary Exploration Colloquium, September 23 and 24, 1959, Vol. 2, No. 1, p. 20.

(5) Z. Kopal, "Proceedings," Lunar and Planetary Exploration Colloquium, ibid., p. 52.

ANNIVERSARY LETTER FROM THE A.L.P.O. SECRETARY

Foreword by Editor. The following letter from our Secretary, Mr. David P. Barcroft, does the Editor too much credit and the Secretary and others far too little. However, the usual editorial scissors have been spared; for rewriting would too much change the spirit of a message which expresses very well the underlying spirit of the A.L.P.O. and what is best in our Association. Dave Barcroft himself has long been one of our most respected and best loved colleagues and has given unsparingly of himself again and again to assist in countless ways amateur astronomy, amateur astronomers, and the basic purposes of the A.L.P.O.

****

<u>Sesquidecennium</u>

Madera, California
March 2, 1962

Professor Walter H. Haas
Director, Association of
Lunar and Planetary Observers
Pan American College Observatory
Edinburg, Texas

Dear Walter,

It is with the greatest pleasure that I answer "present" at our fifteenth annual roll-call. And of the numerous congratulations of which you will be the recipient, none can be more heartfelt than mine. For we have been together for a long, long time. Years ago, before some of our younger fellow members were born, with the kindness which has ever characterized you, you took me under your wing, and you have never set me adrift though the temptation to do so must have been great at times. I was attempting some lunar observations and was having a pretty bad time of it. Had it not been for your timely encouragement, one more telescope might have landed atop the junk heap.

When in 1942 you published "Does Anything Ever Happen on the Moon?", I realized that I had hitched my wagon to a star; and I determined that the hitch should stay fast. You will recall that I overcame your objections to the title based on its possible implications of sensationalism by pointing out that we could successfully lay the blame at the door of Simon Newcomb. I now confess to a small grudge I have always held against Simon on account of the disdain he manifested, and in his best pontifical manner, toward our Moon. He didn't think there would ever be a flying machine, either.

Anyhow, the rapidity with which our large stacks of reprints of Does Anything Happen dwindled proved conclusively that there were amateur observers everywhere who were avid for material of that kind. I feel that this little lunar classic should not be relegated to oblivion, but should be printed again. Think about it, Walter. As a matter of fact, this was undertaken a few years ago by another amateur organization, but alas, no one is better aware than you are of the perils which are a threat to infant publishing enterprises; and this one was stricken down in the midst of a laudable endeavor. Does Anything Ever Happen was the first treatise on selenology to appear on this continent of any consequence from the time your brilliant mentor, W. H. Pickering, laid down his pen in order to "join the Majority" as the English were wont to say.

There was no large scale newscast to herald what happened in March 1947. As I recollect, there was no fanfare at all. But a proposal had been made, and it was directed to a few people hither and yonder who might be interested. All things considered, the response was surprisingly good. About four months later there were about 50 enrolees; and The Association of Lunar and Planetary Observers was off its launching pad. But its orbit was not to be established and stabilized without a good deal of strenuous work at the controls. For this was a "lift yourself by your bootstraps" operation, if there ever was one, and so it would continue to be for several passes. There appears no hint of this in those choice collectors' items which in toto constitute the back volumes of the journal which members have affectionately nicknamed "The Stroller". But I was there at the start; and from the favorable vantage point to which you had assigned me I think I have had a better opportunity to observe what was happening than anyone else save yourself. I know of problems you had to solve, many appearing to have no solution. I know of obstacles which confronted you which to a less determined soul would have seemed unsurmountable. But I don't think the issue was ever in doubt. You have never faltered; and today our Association is an institution of such strength and stature that it enjoys the respect of astronomical circles throughout the world, and justly so.

And there have never been finer individuals than those who have made up the ranks of the Association during its lifespan. They have been your inspiration; the way in which they have rallied to your call has rewarded you, and amply so.

I have come to feel that every fellow member, regardless of where he may be, and irrespective of whether I know his name, is a personal friend of mine. For if each of us likes to observe the moon and planets with our telescopes, how can we be other than friends? What other type of common interest could form the basis of a warmer friendship? But lest you start thinking that I'm up to my old tricks again, I pause long enough to say that I know they were always your friends, and I only want to share them with you.

Fifteen lighted candles are shedding their pleasant glow on this happy occasion, Walter, and all of these friends of ours are with us. Every one of them wants you to know that he fondly hopes that the future will yield to our Association that which the present so certainly promises, which is another way of saying, "There'll be lots more candles."

Cordially yours,

David P. Barcroft
Secretary, A.L.P.O.

THE 1961 A.L.P.O. SIMULTANEOUS OBSERVATION PROGRAM--FIRST REPORT

By: Clark R. Chapman

Abstract

This is the first of two articles summarizing the work of thirty-six A.L.P.O. observers in the 1961 Simultaneous Observation Program. All data are presented, and there are numerous illustrations of simultaneous drawings. Matters considered include: phases of Mercury and Venus; latitudes, longitudes, and intensities of features on Jupiter and Saturn; satellite phenomena and central meridian transit timings for Jupiter. The moon and Mars receive little consideration. Average deviations of single observations from the average of the group of observations are given in the final table. For Jovian latitude measurements from drawings, the average deviation from the averages after correction for systematic error is 1.4 parts per one hundred of the polar diameter. Although there are random differences among observers, there are also systematic differences which can be seen quite easily upon examination of the data. Simultaneous observation can be helpful to train observers and to improve the reliability of amateur work. If there is to be another Simultaneous Observation Program, there must be more interest on the part of more observers. Comments are invited by the author; his address is 2343 Kensington Ave., Buffalo 26, New York.

****

A Simultaneous Observation Program was carried out during the summer of 1961 to determine the accuracy of A.L.P.O. observational material. Fifteen target times were listed in my first article, "A Simultaneous Observation Program," in the May-June, 1961, issue of The Strolling Astronomer. Thirty-six observers submitted observations. Some of the results are very interesting.

The list below includes the name, U.S. state or Canadian province, aperture of telescope(s) used to the nearest ½-inch, and the type of telescope (L=reflector, R=refractor) for each observer.

Carl Anderson, N.H.	6 L	Richard Fennelly, Colo.	8 L
James Bartlett, Md.	4½ R	Geoffrey Gaherty, Quebec	6 R, 8 L
Alan Binder, Ariz.	4½ R	Roger Greene, Colo.	4½ L
Klaus Brasch, Quebec	8 L	W. H. Haas, Texas, Jamaica	6 L, 10 L
Clark Chapman, N.Y.	10 L	William Hartmann, Ariz.	4½ R, 12½ L
Doug Cooke, Calif.	4 L	Earl Hicks, Montana	5 R
Dale Cruikshank, Ariz.	4½ R	Harry Jamieson, Ill.	10 L
Charles Cyrus, Md.	10 L	Craig Johnson, Colo.	10½ R, 3½ L
Roger DeKing, N.Y.	2½ R	Dennis Jones, Calif.	3 L
Jack Eastman, Calif.	12½ L	James Loudon, N.J.	6 L

Pat Lowry, Calif.	12½ L, 8½ L	Charles Ricker, Mich.	6 L
Russell Maag, Missouri	6 L, 4 L	George Rippen, Wisc.	6 L
James Marshall, Texas	2½ R	Leif Robinson, Calif.	10 L
David Meisel, W.Va.	8 L	Bob Shayler, Calif.	8 L
John Milne, N.Y.	2½ R	James Sitler, Penna.	4½ L
Dennis Milon, Texas	8 L	George Wedge, Quebec	6 R
José Olivárez, Texas	2½ R	Mac Wellman, Ohio	4½ L
Tom Osypowski, Wisc.	12½ L	Fred Wyburn, Calif.	4 R

There will be two final reports on the program. This first report primarily will summarize the observations that were reported and will present the data for the reader to draw his own conclusions. The second article will be devoted to interpretations of the work submitted and will summarize some of the comments concerning the problem of the accuracy of amateur work which I have received in correspondence. I hope that the illustrations and material presented in this paper will provoke further discussion.

The lunar observations received for the program are completely beyond analysis because there is so much disagreement! I will postpone all discussion of these observations until the second article.

A number of people have suggested that another Simultaneous Observation Program be carried out again this year. This will depend on the cooperation of A.L.P.O. members. To be truly worth-while, there must be more observations by more of the people. Also, there will have to be provisions made for <u>good</u> simultaneous photographs; during 1961 only three photographs were submitted, of which only one was worth-while in reducing the data. A new program will have to be a more disciplined effort with every observer using the same observing form and making his drawings and other observations at exactly the same time. Simultaneous lunar observations will have to be devised differently (with everyone using general outlines from the <u>Photographic Lunar Atlas</u> and with everyone concentrating on the accuracy of smaller detail). I would appreciate comments on the possibility of another program. If one is to be carried out, it will be announced in the next article.

Some people have even suggested that the Simultaneous Observation Program be made a permanent section of the A.L.P.O. to serve as a training course for newer A.L.P.O. observers. This suggestion surely merits much thought. The A.L.P.O. cannot continue to publish drawings made by inexperienced or inaccurate observers. There is, nevertheless, a need for encouraging new observers and helping them to see their faults and to improve their work. Arbitrarily not using the observations of a new observer for one year would be a poor practice because it would have a discouraging effect. Also, it has been my experience that the first observation of a new observer can be quite reliable (although this is the exception) while some observers never seem capable of making satisfactory observations. Comments on this subject will gladly be incorporated in the second article if they are sent to me quickly.

The rest of this article will be devoted to a summary of the observations submitted, with the exception of the three series of lunar observations. Few observations were received for the early dates. Five or more drawings were received for the observations on July 5, July 18, July 25, August 2, and August 17.

<u>June 16, 1961. 1:00 - 4:45 U.T. Mars and Uranus.</u>

The intention was to have observers draw detail on the planetary surfaces and to make careful estimates of the positions of the two planets. Only one of the four observers who submitted observations used an instrument large enough to record surface detail on Mars. The other observations were only approximate drawings of the planets with respect to some stars in the same field of view.

<u>June 21, 1961. 45 minutes before local sunrise. Venus.</u>

Only two observations were received. Although the predicted phase was just over 50%, both observers agree that the terminator was still concave. The phases measured from the drawings are 44% (Hicks) and 48% (Johnson). Both drawings show some faint surface detail; and while there are no glaring disagreements, Johnson draws the darkest region hugging the terminator while Hicks draws the darkest region in the middle of the crescent. Both observers record polar caps and both agree that the northern cap was slightly larger than the southern cap. It is not possible to compare the intensity estimates because only two sets were made and intensity scales for Venus are quite arbitrary.

<u>June 23, 1961. 8:05 U.T. Jupiter.</u>

Only two drawings were received near the target time. The detail shown is rather limited because both observers were using rather small instruments. The agreement on the detail is quite poor. The latitudes of five belts shown on both drawings were measured linearly (polar diameter=100). There was a fairly uniform systematic error between the two drawings of eight parts in 100. This would be an error of nine degrees in the equatorial regions and well over a dozen degrees in temperate latitudes.

The same two observers made intensity estimates. Since intensity scales are rather arbitrary despite the attempts for more uniform definitions, both scales were transformed so that the darkest belt was given a value of 2.5 and the brightest zone a value of 7.0. The average difference between the intensity estimates for the intermediate features was 1.7 intensity units. This exceptional disagreement is partly caused by a very uneven use of the scale by one observer. Unfortunately, there were no observations with which to compare central meridian transits timed by one observer and satellite phenomena timed by a third.

<u>June 27, 1961. 7:50 U.T. Jupiter.</u>

Again only two drawings were received, both made with larger instruments. The observers agree on the major detail and on some minor detail, but there are several large disagreements. Five comparable latitude measurements have an average systematic error of 3 parts per one hundred, and four longitude measurements have a random error of 6 parts per one hundred.

<u>July 5, 1961. 45 minutes before local sunrise. Venus.</u>

Figure 1 shows six drawings of Venus (two of which were made by the same observer at different times). The agreement on the surface detail drawn is obviously unsure, although some similarities exist between some of them. Terminator detail is similar on the drawings of Chapman and Haas. The features shown on Marshall's earlier drawing and Anderson's drawing could be the same. Marshall's later drawing has several features in common with the drawing by Haas. I will leave it to the reader to decide if these similarities are real.

All observers drew the terminator slightly convex. The phases as measured from the drawings are as follows: Anderson 56%, Chapman 53%, Haas 54%, Marshall 52%, and DeKing 64%. The mean deviation of the first four drawings is just over 1%. The predicted phase was 57½%. Peculiar terminator shapes seen by Anderson and different ones seen by Haas are not confirmed. Intensity estimates by three observers show little or no agreement.

<u>July 18, 1961. 6:15 U.T. Jupiter.</u>

The response to this alert was exceptionally good. Figure 2 shows eleven of the drawings received. The scale is somewhat small and Gaherty's drawing is quite dark, but it should be possible to see nearly all of the original details. The figure second from the right in the top row is a drawing by the author made from a photograph taken by Osypowski. The contrast in the photograph-drawing is greatly increased, and the major positions were measured from the photograph. Please note that the drawings were <u>not</u> all made at exactly the same time. The agreement on most of the drawings is surprisingly good. Several additional drawings were received and are used in the following analyses but were not made near enough to the target time to be comparable with the eleven drawings reproduced in the illustration.

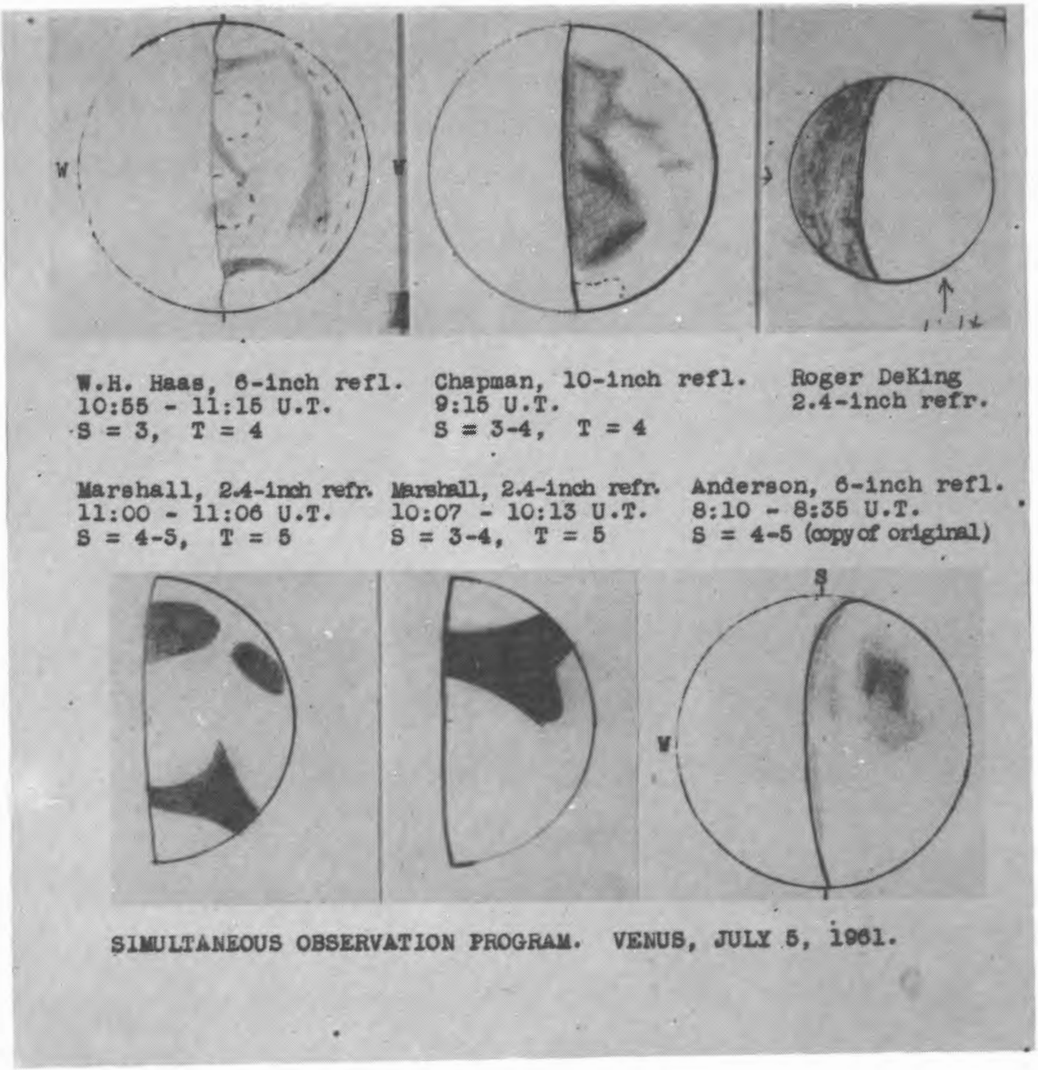


FIGURE 1

****

The latitudes of ten features were measured from eleven of the drawings received. The data derived from these measurements bring forth some very significant information, so the entire analysis is printed in Table 1. The individual numbers represent the "latitudes" of features measured arbitrarily from the south pole on a special scale of 100 = the polar diameter. At the bottom of the table are listed for each feature the number of observations, the average "latitude," the probable error of the average, the average deviation of the individual measurements, the average deviation of the individual measurements corrected for the observers' systematic errors, and the "latitude" as measured directly from Osypowski's photograph for comparison purposes. The rightmost column gives the systematic error of each observer relative to the average.

Table 1. Jovian Belt "Latitudes," July 18, 1961, 6:15 U.T.

Observer	SPR_n	$SSTB_s$	$SSTB_n$	STB_s	RS_s	RS_n	SEB_s	SEB_{ns}	NEB_n	$NNTB_s$	Syst. Error
Binder	10	15	18	25	27	38	36	46	65	83	-1
Chapman	7	12	16		25	35		45	66	82	-3
Cruikshank	8	15	20	26	25	39	37	46	66	81	-1
Gaherty	13	18	21	26	26	39	40	48	67	87	+1
Hartmann	6	14	17	22	22	32	32	36	59	81	-5
Hicks			18		32	42		50		79	+1?
Maag				19	25	38		41	62	78	-4
Milon	14	19	24	29	32	44	38	49	68	81	+2½
Osypowski	12	18	24	29	29	41	42	51	70	83	+3
Ricker			27		32	44		51	67	80	+3
Wedge			21					52	71	82	+2½
No. of Observations (n)	7	7	10	7	10	10	6	11	10	11	
Avg. "Latitude"	10.0	15.9	20.6	25.1	27.5	39.3	37.5	46.8	66.1	81.5	
Prob. Error	±0.8	±0.6	±0.8	±0.9	±0.7	±0.8	±0.9	±1.0	±0.7	±0.5	
Avg. Deviation ($\frac{\Sigma d}{n}$)	2.6	2.1	2.8	2.7	3.1	2.7	2.5	3.6	2.5	1.7	
Avg. Dev. corrected for Syst. Error	1.1	0.9	1.6	1.4	1.6	1.5	1.1	1.4	1.2	2.8	
Photographic Latitudes	-	16	-	-	25	41	39	48	68	86	

Assuming the theory of least squares to apply (which it does not do rigorously for less than a few dozen observations), the standard deviation of each average value $\sigma = \sqrt{(\Sigma d^2)/n(n-1)}$ is approximately 1.2 percent. The probable error (0.6745 σ), which gives a 50% chance that the "true" value is inside (or outside) the limits given, is about 0.8 percent. The average deviation of each measurement from the average is only about 2.6 parts per hundred of the polar diameter. By far the most interesting piece of information which can be seen from the table is that nearly all of the deviations are the result of the systematic errors of each observer relative to the average. Every systematic error listed is significant with the possible exception of Hicks'. (For instance, the -1% error of Cruikshank is an average of the following deviations: -2, -1, -1, +1, -3, 0, -1, -1, 0, -1). When the systematic errors listed here are compared with those on other Jupiter target dates, it is apparent that they are partly the result of personal equations, although the systematic error of an observer is more consistent on the latitudes of one drawing than between latitudes on drawings made on different dates. If the "latitudes" were all corrected for the systematic errors, the mean deviation of each measurement would be only 1.4 parts per one hundred of the polar diameter. In the systematic error column, a minus number indicates that the observer draws features somewhat south of their true location.

A determination of the systematic errors of observers in respect to longitude would be far more beneficial because this value would allow systematic corrections to be applied to central meridian transits. Unfortunately, only five observers made drawings precisely at the target time. Four features were measured for longitude from the drawings of Cruikshank, Gaherty, Maag, Milon, and Osypowski. The average deviation (parts per one hundred of the equatorial diameter) are listed here: following end of Red Spot, 2; center of J III, 3; center of festoon just following J III (not

SIMULTANEOUS OBSERVATION PROGRAM

JUPITER
JULY 18, 1961

PREPARED BY:
CLARK R. CHAPMAN

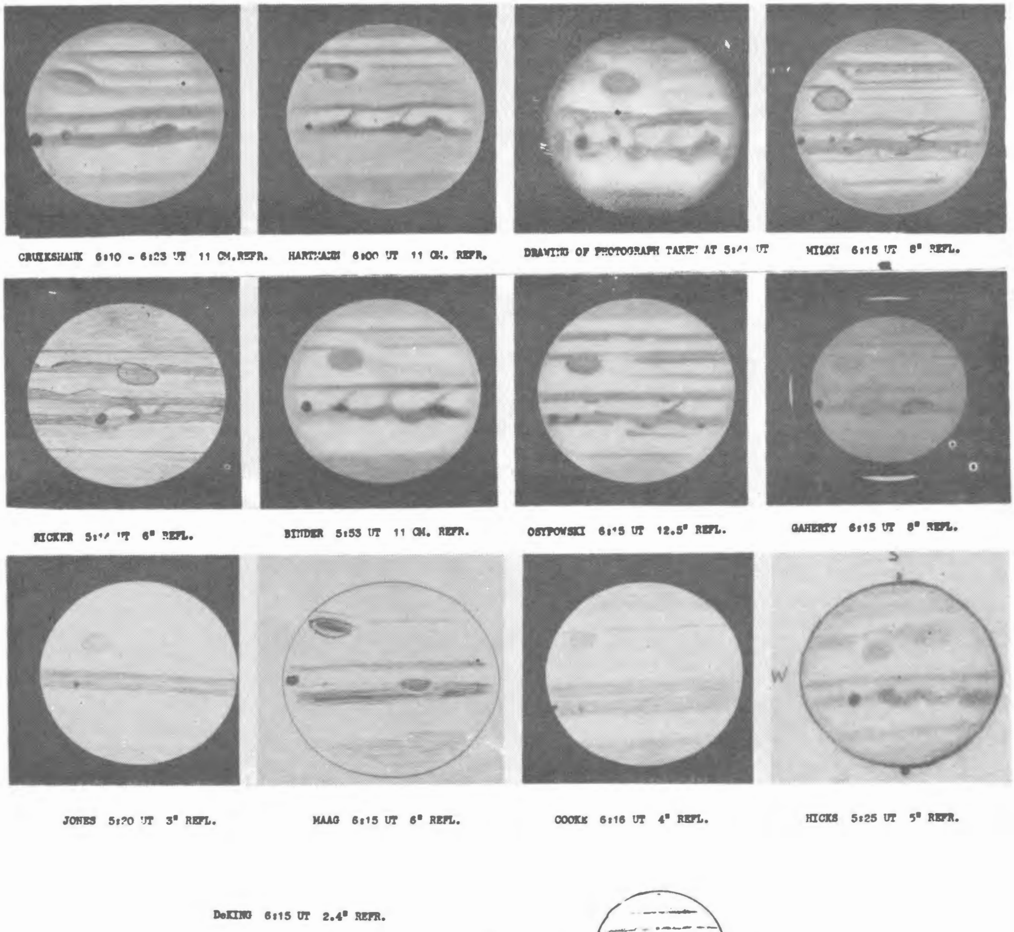


FIGURE 2

****

measured on Maag's drawing), 1½; preceding end of largest hump on the NEB_s, 1. This average longitudinal error of 2% of the equatorial diameter would correspond to an error of 2.2 degrees at the center of the disk, which is very good accuracy for drawings.

Five observers (Chapman, Gaherty, Maag, Milon, and Ricker) timed central meridian transits. We wish to thank them for providing the data compiled in Table 2.

Table 2. Central Meridian Transits, July 18, 1961.

Feature	No. of timings	Mean time	Average deviation	Extremes
J III shadow	2	4:33	5 mins.	4:28 - 4:37
Red Spot, preceding	3	4:59	2 mins.	4:58 - 5:02
J III	4	5:11	3 mins.	5:08 - 5:15
Red Spot, center	4	5:18	2 mins.	5:14 - 5:22
Red Spot, following	4	5:35	3 mins.	5:29 - 5:39

The weighted average deviation of just under three minutes corresponds to an error of only about 1.7 degrees per transit timing.

Some observers (Chapman, Cooke, Gaherty, Greene, and Wedge) timed the satellite phenomena, as was asked. We wish to thank them for the data compiled in Table 3.

Table 3. Jovian Satellite Phenomena Timings, July 18, 1961.

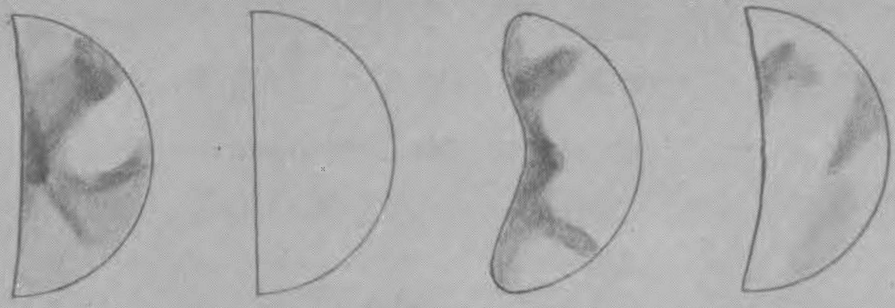
Phenomenon	No. of timings	Mean time	Average deviation	Extremes	Predicted time from A.E.N.A.
J I Sh. Egress	2	3:03,U.T.	0 mins.	3:03 - 3:03	3:03,U.T.
J III Tr. Ingress	4	3:31	1.2 mins.	3:29½ - 3:32½	3:30
J III Sh. Egress	3	6:17½	1.7 mins.	6:15 - 6:19½	6:20
J III Tr. Egress	2	7:05.7	1.3 mins.	7:04½ - 7:07	7:05

Six observers made intensity estimates of the features, ostensibly on the 0 = shadow to 10 = most brilliant white A.L.P.O. intensity scale. Unfortunately, since this scale has no rigorous standards, these estimates could not be used in their raw form and had to be converted to a uniform scale. The estimates of each of the six observers were converted by a linear transformation to a different scale where the NEB = 3.0 and the NTrZ = 7.0. Table 4 below shows the number of estimates, the average on the new scale, and the mean deviation for each feature estimated.

Table 4. Intensity Estimates at 6:15, U.T., July 18, 1961.

Feature	No.	Avg.	Mean Deviation	Feature	No.	Avg.	Mean Deviation
J III Sh.	4	0.1	0.4	SEB_s	3	5.2	0.5
J III	4	1.8	.5	SEB_n	6	3.4	.3
SPR	6	4.7	.3	EZ	5	6.5	.4
SSTB	4	3.6	.4	NEB	6	(3.0)	(0)
STeZ p	2	6.9	.1	NTrZ	6	(7.0)	(0)
STeZ f	4	6.1	.6	NTeZ	4	7.0	.1
STB p	3	3.7	.7	NTB	1	5.9	-
STB f	4	4.7	.7	NNTB	4	4.4	.5
STrZ	3	6.6	.5	NPR	6	4.6	.3
Red Spot	6	4.0	.7	SSTeZ p	2	4.9	.1
SEB Z	5	6.8	.4	SSTeZ f	3	6.6	.4

Most of the intensity averages are accurate to a very few tenths of an intensity unit. The average deviation of each estimate (disregarding the NEB, STrZ, and NTB) from the average is 0.42 intensity units. This is a small enough error still to warrant recording estimates to the nearest tenth. A computer probably could have found a closer fit for the various original intensity scales used and might have cut this deviation in half. It is obvious that our difficulties lie not in the problem of estimating intensities

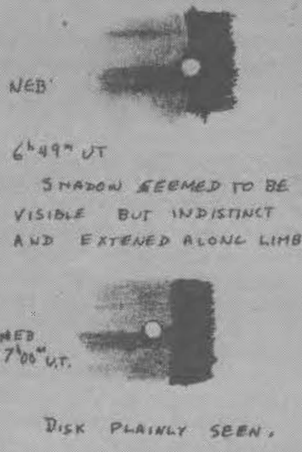


Chapman, 10" refl. 9:45 U.T., S = 3. DeKing, 2.4" refr. 9:45 U.T., S = ? Gaherty, 6" refr. 9:20 U.T., S = 1 - 2. Wedge, 6" refr. 9:30 U.T., S = 1 - 2.

FIGURE 3. SIMULTANEOUS DRAWINGS OF MERCURY, JULY 23, 1961.

Binder, 4.3-inch refr.
6:32 U.T., S = 7, T = 4.

Hartmann, 4.3-inch refr.
6:28 U.T., S = 5, T = 3.



Hartmann. J III in transit.

Chapman, 10-inch refl.
6:30 U.T., S = 3, T = var.

Robinson, 10-inch refl.
6:35 (?) U.T., S = 4 - 3, T = 2

Meisel, 8-inch refl.
5:40 (?) U.T., S = 5, T = 3.5

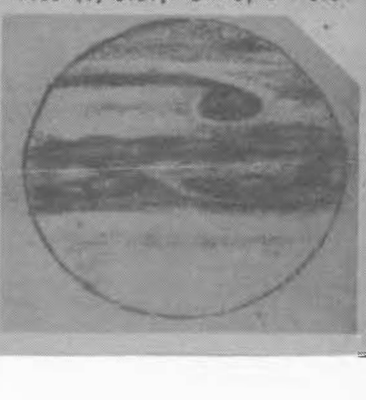


FIGURE 4. JUPITER. JULY 25, 1961. SIMULTANEOUS OBSERVATIONS.

but rather in reducing them to give meaningful results. Chapman, Cooke, Cruikshank, Gaherty, Hartmann, and Hicks contributed intensity estimates for this target date.

If future Simultaneous Observing Programs are held, let us hope that the response for <u>each</u> target time is <u>at least</u> as good as the response for July 18, 1961.

<u>July 23, 1961. Sunrise local time. Mercury.</u>

Four observers contributed drawings of Mercury of which three show surface detail. Copies of the four drawings are published as Figure 3. There seems to be some agreement between the drawings of Gaherty and Chapman. Wedge's drawing shows less agreement. None of the observers felt particularly confident about all of the features shown on the drawings.

The phase of Mercury was measured from three drawings: DeKing 50%, Chapman 48%, and Wedge 46%. In addition Gaherty estimated that the phase was 42%. The average phase is 46½%. The average deviation is only 2½%. It is interesting to note that the observed phase was lagging behind the predicted phase (50½%) as is true with Venus.

Intensity estimates by Gaherty and Chapman are similiar but surely no more accurate than the drawings.

<u>July 25, 1961. 6:30 U.T. Jupiter.</u>

Only five observers contributed drawings for this target date, but many interesting comparisons can be made. The five drawings are published as Figure 4. All of the drawings except Meisel's were made within ten minutes of each other, although no two were made at exactly the same time (rendering longitude measurements impossible). The agreement is fairly good. There are some discrepancies: Robinson and Meisel both show a very wide SEB_n while the other three observers show a narrow SEB_n. The partial duplicity of the NEB seen by Chapman and Meisel is not shown at all in the drawings of Robinson and Hartmann. It is interesting to note how the drawings of Chapman and Robinson (made with larger apertures) compare with the drawings made by Binder and Hartmann.

Table 5 below, summarizing the "latitude" measurements from the five drawings received, was compiled in the same manner as Table 1. The probable errors were not computed this time because there were fewer observations, and the computations would not be so meaningful. The observers' systematic errors were computed in the same way as in Table 1. Notice, however, that the three persons who contributed drawings for both dates (Binder, Chapman, and Hartmann) all had negative systematic errors on July 18. Considering that Meisel also has a tendency to draw the belts somewhat southerly, the systematic errors computed here for July 25 are probably somewhat misleading and might be corrected by subtracting 3 units from each of the computed systematic errors. A problem is posed, however, by the fact that the average "latitudes" for the eight features which were also measured on July 18 are nearly all more <u>northerly</u> than on July 18, rather than more southerly. The indication is that latitudes on drawings of an observer tend to be more consistent with other latitudes on the same drawing than with latitudes on his drawings of different dates. The average deviation for each measurement was only 1.7 parts per hundred.

Table 5. "Latitudes" on Jupiter, July 25, 1961, 6:30 U.T.

Observer	SPR_n	$SSTB_s$	STB_n	$STBp_s$	RS_s	RS_n	SEB_s	SEB_{n_s}	NEB_n	$NNTB_s$	Syst. Error
Binder	8	14	25	25	25	38	33	45	66	82	-1.3
Chapman	9	17	29	25	29	41	37	47	67	80	+0.7
Hartmann	12	17	29	24	25	37	36	49	69	83	+0.7
Meisel				18	24	35		40	65		-3.5
Robinson	13	17	33	25	25	37	38	47	70	87	+1.8

(Table 5 - continued)

	SPR_n	$SSTB_s$	STB_n	$STBp_s$	RS_s	RS_n	SEB_s	SEB_{n_s}	NEB_n	$NNTB_s$	Syst. Error
Number	4	4	4	5	5	5	4	5	5	4	
Average	10.5	16.3	29.0	23.4	25.6	37.6	36.0	45.6	67.4	83.0	
Average Deviation	2	1	2	2	1	1½	1½	2½	1½	2	

A very interesting series of satellite phenomena occurred that was observed by four observers. The ingress of satellite J III was timed by four observers. These timings are summarized in Table 6 below.

Table 6. J III Transit Ingress, July 25, 1961. (Predicted 6:47, U.T.)

Name	Contact I	Mid-Phenomenon	Contact II
Binder	6:43	--	6:53
Chapman	6:46	6:49	6:53.5
Hartmann	6:42	6:49	6:54
Robinson	--	--	6:47.5
Average	6:43.7	6:49	6:52.0
Mean Deviation	1.6 mins.	--	2.3 mins.

It will be noted that the mid-phenomenon time derived as the average of the times of the two contacts is 6:47.9. The duration between the two contacts is 8.3 minutes whereas theoretically it would be 8.4 minutes! It is seen that the timing accuracy of a single observer for satellite phenomena is between 1½ and 2 minutes, in good agreement with the results for July 18.

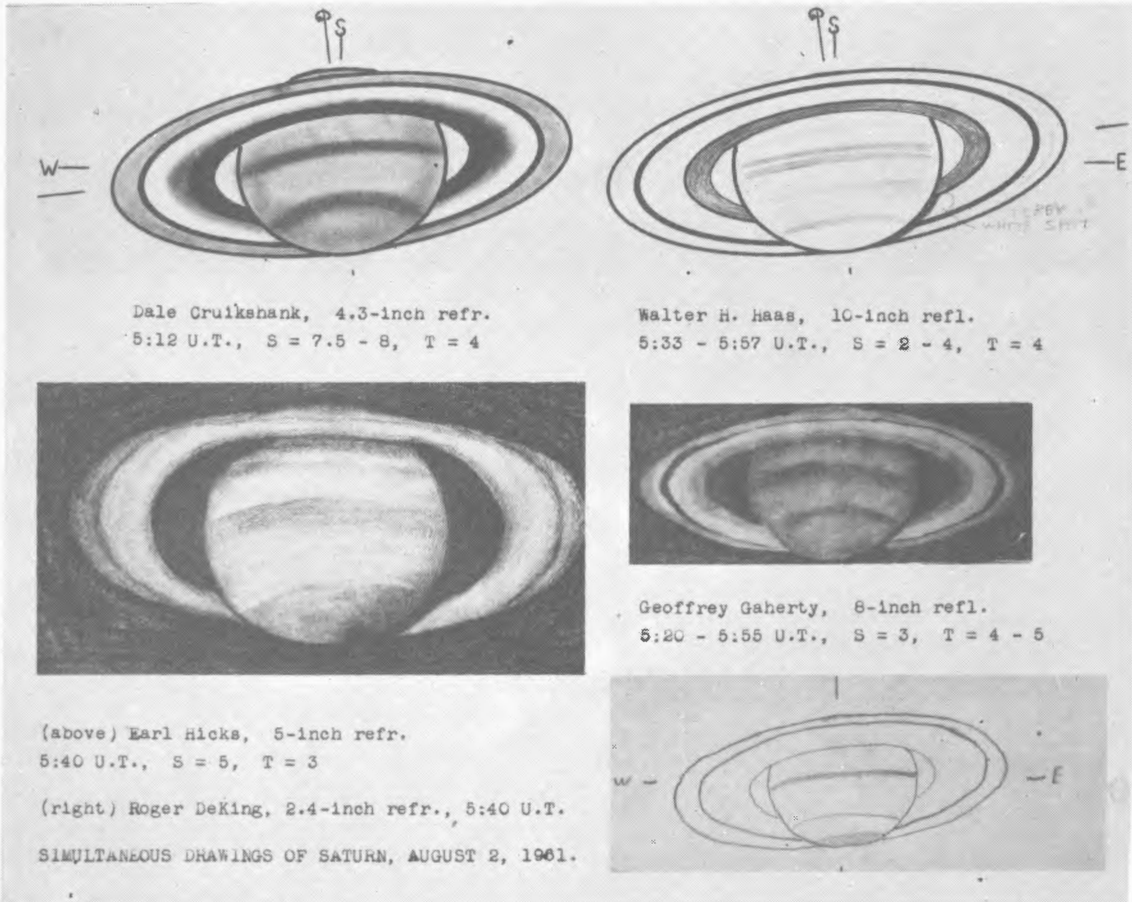
Satellite J III had a very interesting appearance as it entered Jupiter because it was partly eclipsing its own shadow on the date of opposition. The extra diagrams in Figure 4 show the appearance of the satellite and its shadow as seen by Hartmann. Sketches by Binder also show a rather thin shadow north of and somewhat preceding the satellite. These observations are in good agreement with this note from Chapman's notebook: "The shadow was seen as a thin border north and preceding the satellite." Considering the excellent agreement on such minute detail with two of the observers using only four-inch telescopes, some validity might be given to the following comment by Hartmann: "It appeared to me that this shadow was narrower than the disk, so that if someone painted a wide, very black band around the middle of J III, it might be visible in a four-inch." It should be noted that the contrast between Ganymede and its shadow was very great, aiding resolution. B. M. Peek describes in his book, <u>The Planet Jupiter</u>, experiments he has carried out with artificial disks containing large black spots from which he concludes (as mentioned in my first article) that telescopes less than 25 inches in aperture probably cannot show surface detail on the Galilean satellites. Surely more experimentation is warranted here!

Two C.M. transits were timed: (1) following end of Red Spot, 6:12 Robinson, 6:19 Hartmann; (2) center dark projection NEB_s, 6:48 Chapman, 6:53 Hartmann.

<u>August 2, 1961. 5:40 U.T. Saturn.</u>

Five drawings of Saturn were received and are published as Figure 5. The agreement is not particularly good. The only features definitely seen by every observer were Cassini's Division and the NEB. Hicks shows only a hint of the NTB. Cruikshank apparently did not see the shadow of the ball on the rings. There are many obvious differences in the appearances of the belts and zones.

The latitudes from the south pole of the southern edge of the NEB and the middle of the NTB were measured on the five drawings in parts per one hundred of the polar diameter. The average latitude of the southern edge of the NEB was 40 parts per hundred; the extremes were 37 and 43, and



Dale Cruikshank, 4.3-inch refr.
5:12 U.T., S = 7.5 - 8, T = 4

Walter H. Haas, 10-inch refl.
5:33 - 5:57 U.T., S = 2 - 4, T = 4

Geoffrey Gaherty, 8-inch refl.
5:20 - 5:55 U.T., S = 3, T = 4 - 5

(above) Earl Hicks, 5-inch refr.
5:40 U.T., S = 5, T = 3

(right) Roger DeKing, 2.4-inch refr., 5:40 U.T.

SIMULTANEOUS DRAWINGS OF SATURN, AUGUST 2, 1961.

FIGURE 5

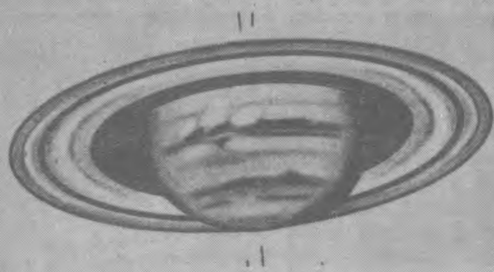
****

the mean deviation was 2 parts per hundred. The average latitude of the NTB was 75 parts per hundred; the extremes were 67 and 82, and the mean deviation was over 5 parts per hundred. The error for the NTB is definitely larger than it should have been (compare the drawings of Haas and Gaherty).

Three observers made intensity estimates. In their raw form the estimates were extremely discordant. The three scales were transformed to a uniform scale based on NEB = 3.5, outer part of Ring B = 8.5. The following table summarizes the results.

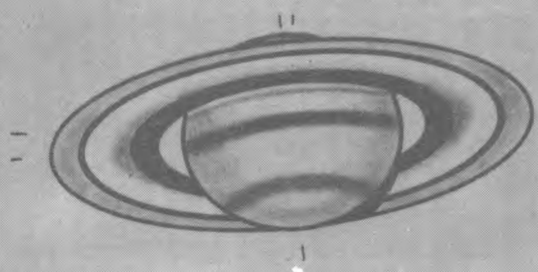
Table 7. Intensity Estimates on Saturn, August 2, 1961, 5:40, U.T.

Feature	No. of estimates	Avg. Intensity	Mean Deviation
Outer part Ring B	(3)	(8.5)	(0)
Ring A	2	6.0	0
Crepe Ring Band	2	0.7	2.3
EZ	3	7.6	0.6
NEB	(3)	(3.5)	(0)
NTrZ-NTeZ	3	6.0	1.1
NTB	2	4.4	0.1
NPR-NPZ	3	5.0	1.0

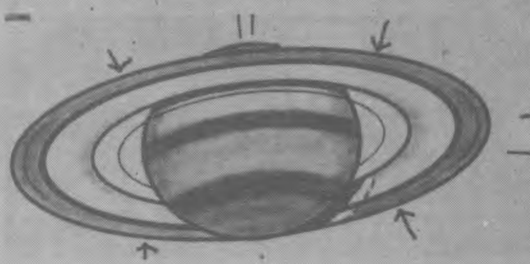


Clark Chapman, 10-inch refl.
4:50 U.T., S = 6 - 8, T = 4

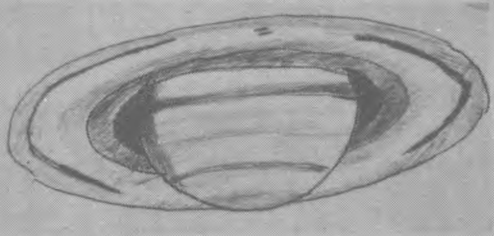
William Hartmann, 12.5-inch refl.
4:49 - 5:12 U.T., S = 7, T = 5



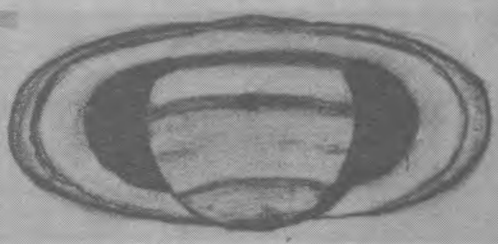
Dale Cruikshank, 4.3-inch refr.
4:10 - 4:50 U.T., S = 7, T = 4



Alan Binder, 4.3-inch refr.
4:32 - 4:45 U.T., S = 8, T = 4-



Charles Ricker, 6-inch refl.
2:30 U.T., S = 3, T = 4



Earl Hicks, 5-inch refr.
4:50 U.T., S = 6 - 7, T = 4

Robert Shayler, 8-inch refl.
4:47 - 5:17 U.T., S = 7, T = 3

Russell Maag, 6-inch refl.
4:50 U.T., S = 4 - 5, T = 5

SIMULTANEOUS DRAWINGS OF SATURN, AUGUST 17, 1961.

FIGURE 6

The average deviation of each measurement (not counting the standards) is 0.8 intensity units, which is much too high.

There was little to no agreement on special features. Robinson reported an NEB spot which might correspond to the feature shown on Gaherty's drawing. Three observers remarked on the unusual lightness of the NPR.

August 8, 1961, 6:00 U.T. Jupiter.

Only three drawings were made. The agreement is very poor. The latitudes of five belts were measured and the average deviation of each measurement was 3.5 parts per hundred of the diameter, which is quite large. The errors continued to be systematic errors of the observers. The systematic errors of the three observers were: Chapman 0, Hicks +5, and Maag -5 (parts per hundred of the polar diameter measured from the south pole). Since the average systematic error of these three observers on the July 18 observation was -2, the above systematic errors for August 8 might be more meaningful if two units were subtracted from each of the numbers.

One satellite phenomenon was timed by all three observers: J IV occultation disappearance (predicted for 6:23): Chapman, 6:18; Hicks, 6:20, Maag, 6:21.

August 17, 1961. 4:50 U.T. Saturn.

The response to the August 17 Saturn alert was good. The eight drawings received are published in Figure 6. Many of the observers had exceptionally good seeing. Chapman observed under practically the best seeing he has ever witnessed from Buffalo. Cruikshank called the definition from his Arizona station "really fine." Every observer recorded the shading along the inside parts of Ring B. Four observers recorded Encke's Division, and three observers noted that the inside regions of Ring A were brighter than the outside regions of the ring. Only one observer did not record the shadow of the ball on the rings.

A number of drawings show spot activity on the ball, particularly Chapman's drawing. There seems to be some real correlation between the NEB spots seen by Chapman, Hartmann, Hicks, and Shayler. There also seems to be some agreement on special features of the faint NTrB on the drawings of Chapman, Maag, and Shayler. Hicks suspected festoons in the region, also.

The latitudes of five belts were measured from the drawings. The average deviation of each measurement was only about 2.2 parts per hundred of the polar diameter. The errors were less systematic than on the Jupiter drawings. Nearly every observer had fairly large errors. Five observers had random errors (relative to the averages); three observers had errors that were definitely systematic: Binder, -4; Chapman, +3; and Shayler, -2.

Several observers made intensity and conspicuousness estimates. The agreement is fairly good, but not enough observers made the same types of observations to warrant a statistical study.

August 22, 1961. 4:15 U.T. Jupiter.

Only three drawings were received, all made at different times.

Four observers witnessed the occultation of Callisto by Ganymede (predicted by the B.A.A. for 3:58½ U.T.). Two observers carefully recorded details on the occultation. Their times for mid-phenomenon are: Milon, 3:59.5; Ricker, 3:59. Hartmann very carefully studied the mutual satellite eclipse two hours later, but he was the only one.

Table 8. Summary of Quantitative Results.

Nature of Observation	Average deviation for a single observation from the average of the group of observations
Phase of Mercury:	2½% of diameter

(Table 8 - Continued)

Nature of Observation	Average deviation for a single observation from the average of the group of observations
Phase of Venus:	1.3% of diameter
Latitude of Jovian feature:	2.8 linear parts per hundred of polar diameter
Longitude of Jovian feature:	3.4 linear parts per hundred of equatorial diameter
Intensity estimate, Jupiter:	0.7 intensity units (when corrected to a standard scale)
C.M. transit timing:	3 minutes
Satellite phenomenon timing:	1.2 minutes
Latitude of feature on Saturn:	2.5 linear parts per hundred of polar diameter
Intensity estimate, Saturn:	0.8 intensity units (when corrected to a standard scale)

I hope that this fairly lengthy presentation of the data will be interestisng and useful to A.L.P.O. members. Surely from this wealth of material there will be comments from some of the readers. Please send them to me at the following address:

Clark Chapman
2343 Kensington Avenue
Buffalo 26, New York

Unfortunately I was unable to send comparison material to each observer who requested it as soon as I had planned. By the time this issue is mailed I hope to have written every observer who requested my comments and the comparison pictures. I wish to thank every observer who contributed to the Simultaneous Observation Program. Let us hope that the work done by the many participants in the program presented in this article and in the forthcoming article will help us to improve the scientific value of A.L.P.O. observational research.

SATURN IN 1961

By: Joel W. Goodman

This report was compiled on the basis of observations submitted by the following contributors:

Observer	Station	Instrument(s)
Bartlett, J. C., Jr.	Baltimore, Md.	5" Rfl.
Bieda, S. W., Jr.	San Jose, Calif.	6" Rfl.
Binder, A.	Tucson, Arizona	11 cm. Rfr.
Budine, P. W.	Binghamton, N. Y.	4" Rfr.
Chapman, C.	Buffalo, N. Y.	10" Rfl.
Cruikshank, D. P.	Tucson, Arizona	11 cm. Rfr.
	Des Moines, Iowa	12" Rfl.
De King, R.	Liverpool, N. Y.	2.4" Rfr.
Dragesco, J.	Paris, France	10" Rfl.
Emig, Stanley	Leavenworth, Wash.	8" Rfl.
Emig, Stuart	Leavenworth, Wash.	8" Rfl.
Gaherty, G., Jr.	Montreal, Canada	8" Rfl.
Giffen, C.	Long Beach, Calif.	12.5" Rfl.

Observer	Station	Instrument(s)
Glaser, P. R.	Menomonee Falls, Wis.	8" Rfl.
Goodman, J. W.	Mill Valley, Calif.	10" Rfl.
Haas, W. H.	Edinburg, Texas	6" & 12.5" Rfls.
Hartmann, W. K.	Tucson, Arizona	12.5" Rfl.
Hicks, E. A.	Reed Point, Montana	5" Rfr.
Johnson, C. L.	Boulder, Colo.	5" & 7.5" Rfrs.
Louderback, D.	?	8" Rfl.
Maag, R. C.	California, Mo.	6" Rfl.
Milon, D.	Houston, Texas	8" Rfl.
Nelson, R. H.	Northridge, Calif.	10" Rfl.
Rippen, G. W.	Madison, Wis.	6" Rfl.; 15.6" Rfr.
Robinson, L. J.	Long Beach, Calif.	12.5" Rfl.
	Torrance, Calif.	10" Rfl.
Schneller, K.	Cleveland, Ohio	8" Rfl.
Shayler, B.	Redlands, Calif.	8" Rfl.
Westbrooke, W. J.	San Francisco, Calif.	4" Rfl.
Williams, D. B.	Normal, Illinois	9" Rfr.

Rfr.: Refractor, Rfl.: Reflector

Saturn came to opposition on July 19, 1961. Its declination varied from about 20°S. to 22°S., placing it rather low for observers at northern latitutdes. The planet more or less subsided to a state of normalcy in 1961, following its display of activity at far northern latitudes in 1960 (1, 2).

The standard nomenclature of Saturn used here is given by Figure 5 on page 127 of the July-August, 1961, issue of The Strolling Astronomer.

Intensity estimates of the most readily observed features of the planet are shown in Table I at the end of this article. A direct scale of 0-10 was employed (0: black, 10: brilliant white). Several contributors submitted estimates on an inverse scale. These were transposed for compiling the table. In the future, all estimates should be made using the direct scale, estimating to the nearest tenth of a unit. This practice may appear to some to be slicing things a bit thin, but with experience surprising precision may be achieved.

The 0-10 scale is somewhat arbitrary unless a reference point is chosen. Some observers provided for this by assigning a value of 9.0 to the outer portion of Ring B, normally the brightest portion of the Saturnian system. Since it will facilitate matters if a standard is selected for use by all observers, let us henceforth set the outer part of Ring B at 8.0. Comparability of estimates should thereby markedly improve.

It cannot be emphasized too strongly that the significance of intensity estimates, like all statistical data, is directly proportional to the numbers involved. The number received for the 1961 apparition was disappointing and much too scant to afford strong confidence. A glaring case in point involves estimates of the same area received from two observers, made within fifteen minutes of each other, which differed by six units on the 0-10 scale. This disparity is extreme; agreement was considerably better for the most part. However, these estimates, which were of the North Polar Region (NPR), were the only two received for the date. Was the NPR very dark, very bright, or neither at the time? It appears that we shall never know with certainty. More estimates would almost surely have settled the question. The greater part of the estimates were made by observers using 4-inch telescopes. This is perhaps one of the most fruitful avenues of endeavor, pertaining to Saturn, for amateurs with modest equipment. The Saturn Section hopes for greater concentration on this program in the future.

The Globe

A. Zones

1. Equatorial Zone. This zone was found to be the brightest area on the globe throughout most of the apparition (Table I), as has often been the case in the past (1, 3-7). Intensity estimates suggested a darkening of the EZ in late July and early August, during which interval it was comparable to the NTrZ and NTeZ (North Tropical Zone and North Temperate Zone, respectively). It then recovered its earlier brilliance and maintained its dominance throughout the remainder of the period covered by our estimates. The color of the EZ was visualized by various observers as white, yellow, or brown.

2. North Tropical Zone (NTrZ). The NTrZ was considered only slightly duskier than the EZ during the first part of the apparition, until about the middle of July. It may then have faded somewhat, coincidental with the darkening of the EZ. From about the second week in August onward, it remained appreciably darker than the EZ. An abundance of faint detail was noted in this area by several observers and will be discussed in a later section of this report.

3. North Temperate Zone (NTeZ). The NTeZ displayed nothing of unusual character, in contrast to its demeanor during 1960 (1). Few intensity estimates of the area were submitted (Table I); those that were indicated a somewhat darker tone than that of the NTrZ. Appraisals of color ranged from orange-brown to white.

4. North Polar Zone (NPZ). This zone was baptized in 1960 with a rash of activity characterized by bright spots centered at about latitude 60°N. (1,2). The area was not very pronounced during 1961 and observations alluding to it were scanty. Haas, in a poor view on February 23, suspected a brilliant area around latitude 60°N. On May 27, the same observer rated the intensity of this region as 7.0, or slightly brighter than the EZ, which he put at 6.5. Budine noted the NPZ as white on July 22, with intensity 6.5. Chapman, on July 10 and August 17, found it narrow and rather inconspicuous, an impression shared by Johnson on August 20 and 27.

5. North Polar Region (NPR). The NPR was the darkest area on Saturn throughout the period covered by the intensity estimates (Table I). Haas, however, found this area remarkably bright on September 4, altogether lacking its customary shaded appearance. He rated the area north of the NNTB (possibly NTB-Recorder) 8.0, making it the brightest part of the globe. This observation is all the more extraordinary since Westbrooke, on the same date and within fifteen minutes of Haas, put the NPR at 2, its darkest of the entire apparition. This anomaly remains a mystery as no other opinions were forthcoming. Robinson noted a bright area within the NPR on September 2, as did Johnson on July 6; and on September 14 Robinson found a very apparent north polar cap, only slightly fainter than the EZ. Chapman found the NPR small on June 7, June 16, and July 10; Williams noted it as faint on July 20.

B. Belts

1. Equatorial Band (EB). This feature was difficult and apparently less pronounced than during the 1960 apparition (1). Generally, it appeared that more than six inches of aperture was required to show it distinctly, although two sketches with smaller instruments depicted it. Fragments of the belt were seen by Chapman as early as May 2. Its intensity was estimated as 4.5 by Haas on May 27. The EB apparently darkened as the apparition progressed, until by late July or early August it appeared unbroken and had achieved its maximum intensity. Even at this time it was narrow, featureless, and considerably less pronounced than either the NEB or the NTB. Chapman found marked festoon activity between the southern edge of the NEB and the EB (Figure 7). These festoons were not remarked by other observers and, unfortunately, central meridian transits were not obtained. The difficulty involved in observing detail of this kind on Saturn is illustrated by Cruikshank's failure to detect a single festoon or belt appendage while using the 40-inch Yerkes refractor in a regular observing program spanning the 1958 and 1959 apparitions (8).

2. North Equatorial Belt (NEB). The NEB was considered the most prominent belt on the planet during the earlier part of the apparition. It may have become somewhat less conspicuous after the first half of August and was thereafter equalled or surpassed by the NTB. It was seen doubled by most observers using larger apertures; and a profusion of irregularities, both in structure and intensity, was portrayed along its southern border by Chapman and Schneller (Figures 7 and 8). Less frequently, similar detail was visualized along its northern edge as well. Again, regrettably, central meridian transits of these features were not submitted in sufficient number for determination of rotation rates. Despite the often brief tenure of many of these markings, as many transits as possible should be secured. In this way, transits of some spots may be timed on a sufficient number of crossings to permit computation of rotation rates. Saturn observers should adopt a policy of never allowing markings seen on the preceding side of the disk to pass untimed.

The color of the NEB was found to be brown, reddish-brown, or gray by various observers.

3. North Tropical Belt (NTrB). The NTrB was difficult and elusive throughout the apparition. The earliest recording of it, as a narrow belt of low contrast, was on July 6 by Johnson, who recovered it on several subsequent occasions. Chapman saw it on August 17 (Figure 7), Cyrus on August 18, and Schneller on September 11. Aside from these, no other sightings were reported.

On the night of August 27-28 [presumably P.S.T. dates--Editor], a party comprising Cragg, Giffen, Glaser, and Goodman noted a wealth of faint, diffuse detail in the region between the NEB and the NTB, using a 6-inch refractor at Mt. Wilson Observatory. This detail did not assume the form of a belt but appeared rather to consist of a maze of wispy festoons and loops. The aperture, however, was insufficient for satisfactory resolution. On the night of September 1-2 [P.S.T. dates--Editor] Giffen, with a 12.5-inch reflector at high powers (500X-800X), again delineated this type of detail in the NTrZ, remarking that "it seemed to merge almost to a NTrB". Robinson, observing on September 14 with an unspecified aperture (presumably a 10-inch reflector), reported: "Activity seems to be apparent in the zone between the NEB and the NNTB [probably referring to NTB--Recorder]. I do not have a telescope large enough to tell what it is--but something is going on. Sometimes this detail seems festoon-like; sometimes, like clouds". It seems likely that apertures considerably larger than 12 inches would have been required for adequate resolution of this detail, the nature of which remains obscure. Although Goodman was afforded brief opportunities to view Saturn with 20-inch and 36-inch refractors during September, seeing conditions were such that elucidation of the area was not possible.

4. North Temperate Belt (NTB). The NTB was very conspicuous during 1961 and was noted by almost all the participants in this report. Intensity estimates suggest that it may have been more pronounced than the NEB during the later stages of the apparition; but, overall, it ranked somewhat below the latter (Table I). Budine, surprisingly, reported that the NTB was not visible on July 24, although he had found it very noticeable two nights previously. The belt appeared uniform to most observers, although several of them detected irregularities along its course. Robinson suspected it of duplicity on September 14 and submitted transits of two spots seen within it. Johnson saw it doubled on July 6 and August 27, noting two festoons extending from the NTB_s to the NEB_n on the latter date.

The color of the NTB was felt to be gray or brown.

5. North North Temperate Belt (NNTB). It is questionable that the NNTB was visible at all during 1961. Several observers reported it but may have confused it with the NTB, which appeared to lie at an unusually northerly latitude. Chapman found it very close to the NTB on July 19. It seems to the Recorder that Chapman's NNTB and the belt referred to as the NTB_n by Johnson on July 6 and August 27 are one and the same feature. Haas estimated the intensity of the NNTB as 4.0 on September 4 in a verbal report but makes no mention of the NTB, which leads one to suspect that he

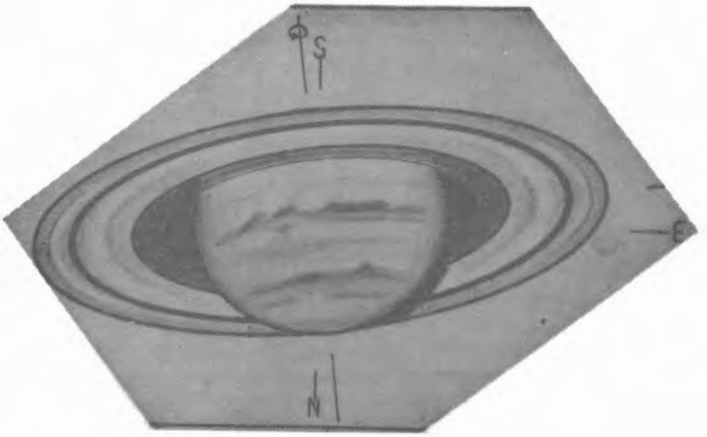


FIGURE 7. Saturn. Clark Chapman. August 17, 1961. 4^h 50^m, U.T. 10-inch reflector. 280X. Seeing 6-8. Transparency 4.

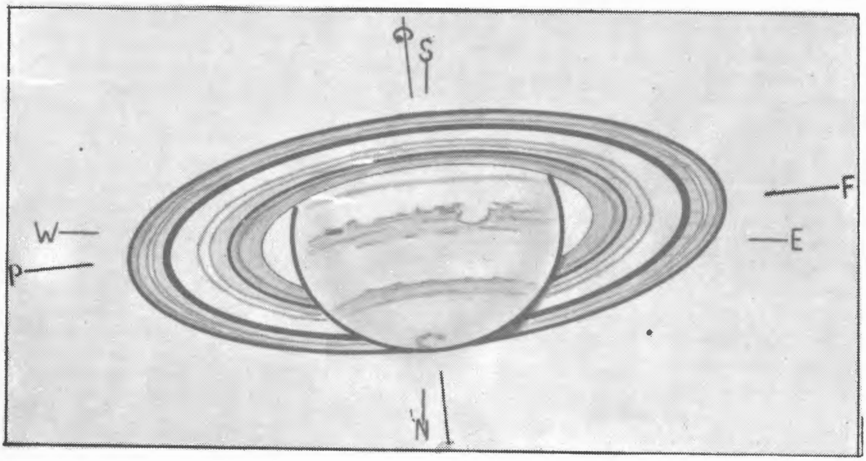


Figure 8. Saturn. Kenneth Schneller. September 9, 1961. 3^h 15^m-3^h 39^m, U.T. 8-inch reflector. 272X. Seeing 9. Transparency 4+.

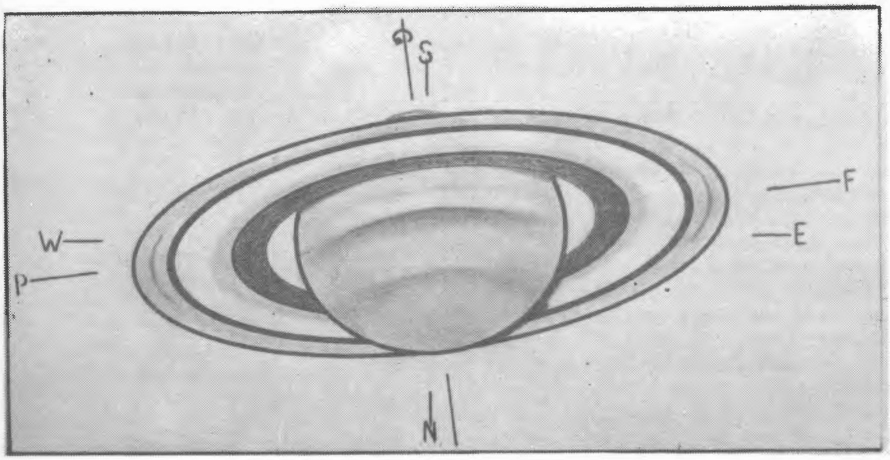


FIGURE 9. Saturn. William K. Hartmann. August 5, 1961. 5^h 16^m-5^h 33^m, U.T. 12.5-inch reflector. 332X. Seeing 4. Transparency 5.

may have mistaken the latter for the former. Budine may indeed have seen the NNTB on August 14, and Chapman likewise on August 17, as it is positioned considerably north of the NTB on their sketches of those dates. These two, then, may constitute the only sightings of this belt during 1961.

Latitudes of Belts. Observers possessing filar micrometers, with clock drives sufficiently accurate to facilitate their use, are urged to attempt latitude measurements of features on the globe of Saturn. In lieu of such equipment, one must resort to measurements on photographs or, less desirably, carefully drafted sketches. Cruikshank determined the Saturnocentric latitudes of the NEB and NTB from sketches made on August 2 and August 8 with an 11-cm. refractor under favorable conditions. His results are shown below:

	NEB (center)	NTB (center)
August 2	$+15.5^\circ$	$+46.0^\circ$
August 8	$+18.4^\circ$	$+36.1^\circ$
Mean	$+17.0^\circ$	$+41.1^\circ$

Three degrees is rather remarkable precision for this method, based on the assumption that the latitudes of the belts are invariable over the period covered and over the globe. Ten degrees is probably about the spread one might anticipate with carefully positioned drawings and accurate measurements. The Recorder is unaware of Cruikshank's method of preparing his sketches, but he would suggest that fractions of degrees be omitted from measurements of this kind because of the considerable uncertainty they necessarily involve. [See also Clark Chapman's article in this issue for accuracies of belt latitudes on drawings.--Editor.]

Glaser submitted a photograph of Saturn taken on July 30 with an 8-inch reflector. The image was commendable for such an aperture and faintly showed the NEB. Determination of latitude from this image yielded a value of approximately $+20^\circ$ for the NEB, in good agreement with Cruikshank's figure. However, very appreciable uncertainty is inherent in this measurement due to the small scale of the image and very low contrast between belt and background, so it can scarcely be considered confirmatory. Larger, more contrasty images from bigger apertures will appreciably advance this phase of work on Saturn.

The Rings

The inclination of the plane of Saturn's rings to that of the earth's orbit averaged about $+22^\circ$ during 1961; hence their northern surface was presented to observers.

Ring A. The outermost ring of established existence in the Saturnian system was, as always, darker than Ring B and was rated about equal to the NTeZ in intensity (Table I). Schneller employed color filters in observations of the rings. On May 30 he found Ring A very dark with a red filter (maximum transmission at 640 $m\mu$), dark with a yellow filter (571 $m\mu$), and about the same brightness as the outer part of Ring B with a blue filter (483 $m\mu$). In this regard, Bartlett, without filters, found Ring A bluish-gray on August 13. He remarked that this ring had previously appeared gray to him, although during past apparitions it had assumed a bluish hue at times. Ring B seemed pale blue as well, but Bartlett attributed this to the delusive effect of the color of Ring A. These independent observations tend to show a greater reflectivity of Ring A, relative to B, in the blue region of the visible spectrum. Observers with filters of characterized transmission properties would do well to attempt to gather evidence concerning this impression. With a series of filters on August 8, Schneller found the preceding ansa of Ring A brighter than the following ansa.

Cassini's Division was seen by all observers, completely around the visible portion of the rings by most. It is of interest to note that several observers with smaller apertures did not consider Cassini's jet black but rather grayish-black. The mean of 10 intensity estimates by two observers using 4-inch instruments was 1.7, while 5 estimates by three observers with 6-inch to 12.5-inch telescopes averaged 0.2. The numbers involved are too small to be conclusive; but they do suggest that ample aperture, at least 6", may be required to reveal Cassini's as a pure black gap.

Encke's "Division" was reported by a number of observers (Table II). It was customarily seen as deep gray rather than black. Several contributors found it double, with the components usually at A4 and A6 (Figure 8), although one observer felt that they were closer together than this. Observers with apertures smaller than 8 inches have periodically ascribed duplicity to this feature. The width of Ring A in the ansae is about 2.4 seconds of arc. It can thus be readily appreciated that resolving two diffuse lines of dubious contrast less than 0".5 apart would, to say the least, be a touchy proposition. The Recorder does not intend to embark on a discussion of the limits of telescopic resolution here. An excellent montage of expert opinions on the subject can be found in (9). Let us simply say that it appears unlikely that Encke's can be seen in its true aspect with 6-12 inch telescopes. Perhaps a somewhat more critical approach should be applied when attempting to observe features of so delicate a nature. One of the most valuable attributes a scientist, amateur or professional, can acquire is a recognition of the limitations of the methods at his disposal, accompanied by an ability to work within those limits. Overtly undramatic data of high reliability is immeasurably more valuable than data amassed at or below the threshold of sensitivity.

The real visual nature of Encke's "Division" would appear to be best represented by Lyot's description (10), using a 24-inch refractor under very fine conditions at the Pic du Midi. Three broad, rather diffuse minima were depicted, their combined breadth encompassing about 45 percent of Ring A. They were centered at about A2.2, A4.0, and A6.0. Photometric tracings of the rings with large telescopes (11) also reveal three minima, with positions centered at approximately A3.5, A4.7, and A6.5. This constitutes impressive confirmation of Lyot's observations, his positions being derived from measurements with a double-image micrometer. As stated previously, it is unlikely that Encke's can be seen correctly with apertures in the 6-12 inch range. Perhaps observers reporting it double with such instruments see the two inner minima unresolved at mean position A4 and can just resolve this composite from the A6 minimum. They are, however, almost always drawn narrower than they should be. The area between the minima is sometimes portrayed as brighter than the rest of Ring A (Figure 8), an impression unconfirmed by photometry (11) or by visual observations with large apertures (10). It can in all likelihood be ascribed to a contrast effect.

Giffen, Robinson, and Schneller reported a minimum at A8. This feature has been recorded previously by A.L.P.O. members (1), and its existence seems firmly established. Lyot noted it visually (10), as did Dollfus photometrically (11); and it is apparently darker than any of the minima in the Encke complex. The difficulty involved in its delineation may be attributable to its narrowness relative to the Encke complex.

Giffen and Robinson, though not independently, detected a minimum at about A2. This position is close to that of Lyot for the innermost component of the Encke complex.

Ring B. Ring B was the brightest part of the Saturnian system (Table I). This appeared to be consistently the case throughout the apparition, although scattered estimates had the EZ rivalling it at times.

B0 was the most frequently reported division in Ring B (Table II) and, in fact, is considered by Lyot to have more than half the breadth of Cassini's gap (10). B0 was followed by B3 and B5, which were reported by Budine, Giffen, Johnson, Robinson, and Schneller. B5 appears to be an authentic minimum, but B3 is probably an imperfectly seen impression of minima at about B1 and B2, as depicted by Lyot (10) and Dollfus (11). It has been reported as a pair of minima by A.L.P.O. members in the past (1). A minimum at B7-8 was reported by Giffen, Johnson, and Robinson. This, too, appears well authenticated and is the most attenuated gap in Ring B (11).

Ring C. Ring C was easily the darkest segment of the Saturnian system (Table I). It was well seen by a number of observers and impressed them as being brown or gray in tone. A rift at C8 was reported by Schneller on August 29 and September 9. Giffen and Johnson found a fissure at C5 on September 2 and August 27, respectively.

Ring D. This enigmatic feature was reported only by Johnson, who viewed it on August 16 and 27. He considered Ring D about 0.20 to 0.25 as bright as Ring C and remarked that it was "surprisingly prominent during the best seeing periods" on the latter date. The evidence for the existence of Ring D has been reviewed by Baum (12) and Cragg (13) and is remarkably flimsy for a feature reportedly visible at times with 6-12 inch instruments. Adequate observation of features of this kind requires above all else, and excellent seeing conditions aside, light gathering power of considerable magnitude. If Ring D is of the order of ¼ as luminous as Ring C, or even brighter according to Cragg (13), then it should appear about as obvious in a 12-inch telescope as the latter appears in a 6-inch. However, in fact, there is no record of its observation in any of the "giant" telescopes or even in moderately large observatory instruments (24 inches or more), despite recent detailed studies of Saturn with such apertures (8,10,11). Cragg felt he saw it projected against the globe with the 60-inch Mt. Wilson reflector (13), but his observation is open to alternate interpretations. A requisite for substantiation of Ring D is observation of it off the globe of the planet, and that by instruments capable of rendering Ring C rather markedly apparent.

Techniques other than orthodox visual observation might find application in the elucidation of Ring D. Ring C has been recorded on photographic plates by overexposing Rings A and B. That Ring D could be photographed by extending this technique is perhaps questionable because Ring A might fog the plate at D's anticipated position, but the attempt should be worth-while with large apertures. In this regard, an occulting bar might profitably be employed both visually and photographically. Occultations of stars by Saturn would, of course, present excellent opportunities for verification, preferably using photoelectric photometers since decreases in brightness might be very small. Be that as it may, in our present state of knowledge Ring D must be regarded as extremely uncertain.

Satellites

Saturn's satellites were given little attention during 1961. Westbrooke submitted a series of magnitude estimates of Enceladus, Tethys, Dione, Rhea, and Iapetus on seven dates spanning June 16 and September 5, assuming Titan to be constant at 8.3. No more than four estimates for any satellite were included, however; and since Westbrooke's work was not supplemented by others, little information could be derived therefrom.

Conclusions

Saturn appeared quiescent during 1961. Its aspect was similar to that presented during many previous apparitions, and no abnormalities of significant duration were noted. The North Polar Zone, so conspicuous in 1960, was noted on several randomly disposed occasions but was normally absent or weak. Figure 9 depicts the planet as it was typically shown by a number of observers using larger apertures. It is included to demonstrate that experienced observers do not always agree on minute detail and to discourage a compulsion to see fine structure. [I most heartily concur.--Editor.]

It seems to the Recorder that a good deal of effort expended on Saturn could be channeled more judiciously. While searches for minor divisions in the rings with small apertures are exciting and have their place, they result in little useful information. Observers are urged to apportion their time so that more meaningful projects receive attention more commensurate with their significance. Intensity estimates may be made by observers possessing very modest equipment and no special accessories. Color determinations, preferably with filters of characterized transmission, may yield fascinating information about the rings as well as features on the globe. When markings suitable for transit determinations are seen, they should unfailingly be timed. Latitude measurements of belts and zones may be made from carefully constructed drawings, by direct measurement using a filar micrometer, or from good quality photographs. Projects of this kind have been outlined previously by Cragg (14).

In short, there is enough to be done on Saturn to keep everyone busy. Let us hope that 1962 finds the A.L.P.O. in possession of an impressive mass of data on the above aspects of the planet.

A Requested 1962 Study of Saturn. On several occasions in the past, amateurs have noted a bluish hue in Saturn's Ring A. This phenomenon has been detected both with and without the use of filters, although filters should markedly enhance the effect. Confirmation of this bluish hue requires a large number of observations by suitably equipped observers. The Saturn Recorder suggests that all interested observers participate in a program involving intensity estimates of Ring A, relative to Ring B, using a series of color filters. Eastman Kodak Wratten Filters #47B (blue), #58 (green), and #25 (red) provide a complementary assortment since they transmit nearly mutually exclusive portions of the visible spectrum. Filter #47B is rather dense, and observers with instruments smaller than 10 inches in aperture may find it necessary to substitute #48, which has a maximum transmission at a somewhat higher wavelength, in its place.* Some of these filters may have to be acquired by special order as local photographic supply houses frequently do not stock them. The proposed program would set Ring B at a standard intensity of 5 on the direct scale of 0 (dark) to 10 (bright) in all filters. The intensity of Ring A would then be compared to that of B in each of the filters. It is hoped that enough observers will participate in the program to permit accumulation of a large body of data on the problem. [Subject to Mr. Goodman's approval the standard might perhaps best be the outer one-third of Ring B since this ring is brighter in its outer part than in its inner parts.--Editor.]

Bibliography

1. Cragg, T. A., Str. A., 15, 124 (1961).
2. Cragg, T. A., ibid., 14, 121 (1960).
3. Cragg, T. A., ibid., 15, 60 (1961).
4. Cragg, T. A., ibid., 14, 122 (1960).
5. Cragg, T. A., ibid., 12, 16 (1958).
6. Cragg, T. A., ibid., 10, 139 (1956).
7. Cragg, T. A., ibid., 10, 37 (1956).
8. Cruikshank, D. P., ibid., 14, 129 (1960).
9. Str. A., 7: 42, 56, 99, 108 (1953).
10. Lyot, B., Astronomie, 67, 3 (1953).
11. Dollfus, A., in Planets and Satellites, Kuiper and Middlehurst, University of Chicago Press, 1961.
12. Baum, R. M., Vega, p. 52, Jan. 31, 1954.
13. Cragg, T. A., Str. A., 8, 102 (1954).
14. Cragg, T. A., ibid., 7, 53 (1953).

Table I. Intensity Estimates of Features on Saturn in 1961.

Feature	Estimates			
Zones	No.	Low	High	Mean
Equatorial	32	4.5	7.5	6.6
North Tropical	30	5.0	8.0	6.1
North Temperate	9	4.8	6.3	5.4
North Polar	2	6.5	7.0	6.8
North Polar Region	33	2.0	8.0	4.7

*Since writing this paragraph, Mr. Goodman has expressed the opinion that #48 will be preferable to #47B on apertures up to 10 or 12 inches.

(Table I--continued)

Feature	Estimates No.	Low	High	Mean
Belts				
Equatorial	4	3.8	5.5	4.8
North Equatorial	37	1.5	5.0	3.4
North Temperate	33	2.5	5.0	3.7
North North Temperate	2	3.5	3.5	3.5
Rings				
A	32	2.0	8.0	5.2
B	30	6.5	9.0	8.0
C	10	0.3	3.0	1.9

Table II. Observations of Divisions in Rings of Saturn in 1961.

Division	Number of observers	observations	Aperture Range (inches)
A8	3	11	8 - 12.5
Encke's	16	39	4 - 12.5
Encke's as doubled	4	10	7.5 - 12.5
A2-3	2	2*	12.5
B7-8	3	4	7.5 - 12.5
B5	4	12	7.5 - 12.5
B3	5	12	4 - 12.5
B0	8	20	4 - 12.5
C8	1	2	8
C5	2	2	7.5 & 12.5

*not done independently

AN A.L.P.O. MINOR PLANETS OBSERVATION PROGRAM

By: George W. Rippen

The minor planets, the measuring sticks of the Solar System, offer many varied and interesting projects for the amateur with modest equipment. Observations of these small bodies can be made visually, photographically, or photoelectrically. While most of the principal planets in the Solar System have been studiously studied over the years, the asteroids have gone all but unnoticed until the present day. To fill this void, I am suggesting a program of observations which is extremely flexible in order to fit the varied equipment of the readers of this magazine; and if response justifies, an Asteroid Section might be formed in the near future.

Listed in the following table are the positions of the asteroids of which observations are desired. I would like to suggest that a program similar to the following one be followed for making the observations. A series of continuous or nearly continuous observations over a two to five day period with special note of hourly or daily drift and magnitude will be sufficient for those without photographic equipment. Any additional information is, of course, welcome. Those having photographic equipment can make exposures over a period of several weeks. Some of these photographs could be taken in various colors. Another possible suggestion would be a series of observations which would determine the degree of polarization. Those having photoelectric equipment might conduct a series of experiments which could yield information on the variability in light of asteroids. Experiments along this line have been conducted by others in the past and have yielded interesting information, such as on periods of rotation.

Asteroids of high inclinations hold special interest. For this reason, I have included some asteroids with very small inclinations and some with moderately large inclinations. Many of the asteroids with higher inclinations are too faint except for the largest instruments.

Suggested Asteroids

Date 1962	Name	No.	1950 R.A.	DEC.	Probable Magnitude	Inclination
April 16	Metis	9	$12^h46.8^m$	$+03^\circ01'$	+10.1	5°603
26			12 38.7	+03 24		
April 16	Eunomia	15	14 13.3	-31 01	+10.4	10°672
26			14 03.9	-30 22		
May 6			13 54.6	-29 27		
May 6	Daphne	41	13 43.2	+07 46	+10.0	15°873
16			13 40.0	+08 58		
May 16	Harmonia	40	14 15.7	-07 36	+10.9	4°258
26			14 08.0	-07 21		
May 16	Interamnia	704	15 19.7	-36 24	+12.1	17°296
26			15 10.8	-35 24		
June 5			15 03.1	-34 13		
June 25	Ariadne	43	20 02.3	-17 55	+10.0	3°472
July 5			19 55.0	-17 37		
15			19 45.7	-17 27		

The observations of asteroids can yield valuable information on their origin as well as on their general nature. As I mentioned earlier, the response to this program may justify the formation of an Asteroid Section. Such a section could cover a large territory and probably would include the area of search programs. This would make the section unique.

There may be many questions about equipment for projects such as those already mentioned. To say that one must use a telescope of "X" inches for a given project is absurd; however, each project does demand an instrument of at least a certain size. Visual observations, for example, probably could be done with an instrument of six inches or larger while photographic and photoelectric observations probably would need instruments of eight or more inches. I might mention, though, that photoelectric projects need more than size. As for myself, I have used instruments between six inches and fifteen inches on projects involving the asteroids.

Aside from the scientific information which can be gathered from such a project as this, it can also be useful as a training program for the beginning amateur. Such a program would acquaint the beginner with the alpha-delta co-ordinates and with the use of setting circles. He could also learn about the use of star maps, about the precession of the epoch, and about stellar magnitude. Photographic and photoelectric projects would open up a whole new field of techniques. Photographs of the asteroids would teach him about guiding, about the stellar magnitude-exposure problems, and about various photographic principles.

If readers have any questions, they should write to the author at the following address. Observations should also be sent here.

George W. Rippen
1701 Ellen Avenue
Madison 4, Wisconsin

BOOK REVIEWS

Review by Geoffrey Gaherty, Jr.

Der Sternenhimmel 1962. Edited by Robert A. Naef. Aarau, Switzerland: H. R. Sauerlander & Co., 130 pages. Available in the United States from Albert J. Phiebig, P. O. Box 352, White Plains, New York.

Almost every serious observer has a copy of the current American Ephemeris on his bookshelf. This should not prevent him from investigating the smaller handbooks published by various national societies since they contain most of the commonly used information in more concise and convenient form. The Handbooks of the Royal Astronomical Society of Canada and the British Astronomical Association are those most commonly encountered; but the observer with some knowledge of German should give consideration to Der Sternenhimmel, now in its twenty-second year of publication under the auspices of the Swiss Astronomical Society (S.A.G.).

Der Sternenhimmel includes unique features too numerous to describe in detail so that I must simply single out a few which caught my eye. Observers of Mercury will appreciate the ingenious chart for locating the little planet; this not only shows the planet's elongation from the sun but also the angle of elongation relative to the horizon. The layout of the daily and monthly phenomena is a model of clarity with symbols being used very effectively. Everywhere throughout the book thorny points are cleared up by excellent diagrams, half-tones, and Naef's explanations of the terms used. These latter recommend the book to students of German who wish to become familiar with the basic technical vocabulary of astronomy.

On the negative side I would put the binding of the book which seems very flimsy even by the standards of paperback publishing. Sturdier covers would help and probably should be added by the purchaser since this book is deserving of much use at the telescope.

Reviews by J. Russell Smith

An Atlas of the Moon's Far Side, The Lunik III Reconnaissance, N. P. Barabashov, A. A. Mikhailov, and Yu N. Lipsky, editors. Translated by Richard B. Rodman. Interscience Publishers, New York, and Sky Publishing Corporation, Cambridge, Mass., 1961, $7.00.

For many years astronomers have conjectured about the side of the moon they have never seen. A few astronomers have attempted to make a rough sketch of this unknown portion based on what were probably intelligent guesses.

Some definite ideas about the moon's far side have come to us from the Soviet Union's Lunik III, which was launched on Oct. 4, 1959. This space vehicle was the world's first automatic interplanetary station. Carrying a battery of both photographic and television systems, Lunik III passed within 62,500 kms. of the center of the moon and for 40 minutes automatically photographed the lunar surface that is perpetually hidden from the earth. The images were later televised to the earth and received in the Soviet Union. It is interesting to note that the camera used for this work was equipped with a pair of objectives, one with a focal length of 200 mms. and a relative aperture of f 5.6, and the other 500 mms. and f 9.5.

The first part of the book deals with the photographs and their transmission, interpretative techniques, the photometric cross sections, and the reduction of the materials. This is followed by the final lunar map in four quadrants. The maps are keyed for reliable and well defined formations, less well defined formations, formations with uncertain outlines, formations darker than surrounding field, formations lighter than surrounding field, catalogue number, bright rays, and boundary of area accessible to camera. The central meridian of each map is 120 degrees west longitude, and lines of latitude and longitude are given at 10 degree intervals.

The next section of the book, which is by far the major portion, is a catalogue of the formations observed on the moon's far side. This is given in chart form and is divided into first reliability class, second reliability class, and third reliability class objects.

The final part of the book consists of duplicates of 20 plates containing 30 photographs of the hidden side of the moon. These represent the best negatives obtained by the Soviet space probe.

Inside the back cover there is an envelope containing a copy of the lunar map on a large folded sheet. The moon's diameter here is about 14 inches which makes the chart quite suitable for posting.--J.R.S.

****

Astronomical Photography, From the Daguerreotype to the Electron Camera, Gerard de Vaucouleurs, The Macmillan Company, New York, 1961, $6.00.

It seems fitting that Dr. de Vaucouleurs should bring us a book of this type since his astronomical career as well as the science of photography began in France. The author is well experienced in all phases of astronomical photography and as a result is very qualified as a writer on this subject. The aim of this small volume of about 100 pages is to trace the development of photography before it finally established itself as the astronomer's indispensable tool and to serve as a reminder of the early achievements of the pioneers in celestial photography.

The subject is treated in five different sections as follows: The Beginnings of Astronomical Photography: 1839-1851, The Development of Astronomical Photography: 1851-1879, The Rise of Astronomical Photography From 1879-1887, Progress in Astronomical Photography Since 1888, and The Present and Future of Astronomical Photography.

Following an index, after page 96, the author has included 21 plates to show the development and progress of astronomical photography. Subjects include the sun, the moon, the planets, nebulae, composite photography of nebulae, and indirect photography with an image-orthicon television camera attached to a telescope. Plates 20 and 21 show equipment of project stratoscope and a photograph of a small section of the sun taken at 80,000 feet.

The book is recommended for those interested in the history and development of astronomical photography.--J.R.S.

****

Astronomical Spectroscopy, A.D. Thackeray, The Macmillan Company, New York, 1961, $3.95.

This is the second volume in the series A Review of Astronomy, and is designed to bridge the gap between elementary astronomy and purely technical astronomy. It tells of the beginnings of spectroscopy, the instruments, atomic spectra and energy levels, spectra of normal stars, ionization in stellar atmospheres, the Doppler Effect and stellar motions, the spectra of the sun and planets, double stars, gaseous nebulae, interstellar matter, unstable and pulsating stars, spectroscopic determination of distance, galaxies, widths of spectrum lines, and the composition of the universe, as well as stellar evolution and current problems. This work can be recommended for the serious amateur and the student. Includes an appendix of useful tables, a bibliography, and a glossary. Written by a specialist in the field.--J.R.S.

****

Tools of the Astronomer, G. R. Miczaika and William M. Sinton, Harvard University Press, Cambridge, Mass., 1961, $7.75.

A Harvard Book on Astronomy, one of a series, may be considered a basic guide to the instruments used in modern astronomical research. The introductory chapter treats the nature of light and gives the reader a foundation for what follows. Succeeding chapters cover important topics such as photography, telescope optics, construction of telescopes, photometry, spectroscopy, instruments for solar research, and the modern radio telescope. Well written, well illustrated, includes index. Recommended for the amateur, student of astronomy, and manufacturers of scientific instruments.--J.R.S.

ANNOUNCEMENTS

Increased Subscription Rates. With regret we are finding it necessary to raise the price of subscriptions to *The Strolling Astronomer*. The increase is the first since 1949; and mighty few things, including technical magazines, still cost as little as they did 13 years ago. We could continue at the older rates by publishing about the same number of pages as some years ago. We do not think that such a policy would best serve the goals of the A.L.P.O. Astronomical publications these days are growing in size and improving in content, and at a rapid rate. The new rates are:

Single Issue	$1.00
One Year	$4.00
Two Years	$7.00

We shall accept new subscriptions and renewals at the older, lower rates up to June 15, 1962.

Our Travelling Mercury Recorder. Mr. Geoffrey Gaherty writes that he and his father will be away from Montreal during much of May and June on a trip to the R.A.S.C. General Assembly at Edmonton, Alberta, and then to Paris. He hopes to meet some of our B.A.A. colleagues while in Europe. Mr. Gaherty may thus have much to tell us at the A.L.P.O. Convention in Montreal on September 1, 2, and 3, 1962. He requests the patience of correspondents about inevitable resulting delays in his letters.

Book Reviewers Wanted. Mr. J. Russell Smith, our new Book Review Editor, requests A.L.P.O. members who would like to review a book to contact him (address on back inside cover). Adequate reviewing of current books of value to lunar and planetary amateur astronomers is best achieved with many helpers. The reviews need not be long; indeed, the samples on pp. 80-82 should indicate a new kind of review dictated by increasing space problems in *The Strolling Astronomer* and probably actually better suited to the needs of our readers.

A.L.P.O. Jupiter Handbook. Mr. Philip R. Glaser, the Jupiter Recorder, wrote on February 18, 1962, that several dozen Jupiter Handbooks were still in stock. A new edition is being prepared. This Handbook was written by Mr. Elmer Reese and will much help anyone carrying out systematic studies of the Giant Planet.

Availability of Communications of the Lunar and Planetary Laboratory. An exchange has been initiated between the *Communications* of the Lunar and Planetary Laboratory of the University of Arizona, Tucson, Arizona, and *The Strolling Astronomer*. Dr. Gerard P. Kuiper is the Director of the Lunar and Planetary Laboratory. The *Communications* will be kept in the A.L.P.O. Library at Delray Beach, Florida, Mr. Downey Funck being the Librarian (address on back inside cover). Members should take advantage of this opportunity to study current professional astronomical research on the moon and the planets.

Middle East Regional Convention of the Astronomical League. This meeting will be held on May 11, 12, and 13, 1962, at Washington, D.C. The program includes tours of the U.S. Naval Observatory and the Georgetown College Observatory, a star party, a paper session, exhibits, a novel do-it-yourself planetarium show, and sightseeing in Washington. The registration fee of $1.00 per person should be sent to Mrs. William Lipscomb, 906 Waterford Road, Alexandria, Virginia. A.L.P.O. members attending and wishing to set up exhibits should contact Mr. H. J. Walls, 7103 Georgia Street, Chevy Chase, Maryland. Telescopes, their accessories, books, charts, and photographs are all wanted for the Convention Exhibit.

Mercury Solar Transit Photographs. The three photographs of the Mercury solar transit on November 7, 1960, published on page 4 of our January-February, 1962, issue came out somewhat poorly. On Figure 1 the arrows mentioned in the caption are missing on some copies; the image of Mercury is 1-1/8 inches from the left edge of the published picture and 1-1/4 inches from its lower edge. On Figure 2 Mercury lies at the limb of the sun and 7/8 inches below the top edge. On Figure 3 the planet is precisely an inch below the top edge.

Errors in November-December, 1961, Issue. Mr. Takeshi Sato, Hiroshima, Japan, has reported the following errors in the article by Mr. Saheki and himself in the issue mentioned:

1. Page 191, tenth line from bottom. For "on any given night" read "on any given short succession of nights."

2. Page 200. For $E)^3$ read $E)^1$.

3. Page 200. For F) read $F)^3$.

Termination of A.L.P.O. Confirmatory Service. Mr. James Mullaney writes that he must with regret discontinue the large-aperture confirmatory service described on pp. 155-156 of our September-October, 1961, issue. Personal changes in his position at the Allegheny Observatory have required this change. Perhaps in the future someone else can offer such a service. Commenting by letter some months ago on requests made of the Confirmatory Service, Mr. Mullaney felt that most of them were too complex and far too demanding of telescope-time and staff-time. Simple, specific requests requiring but little of a large telescope's limited time are the easiest to satisfy, and hence the ones most likely to be processed quickly and correctly.

Disclaimer. Opinions expressed in articles in The Strolling Astronomer are those of their authors. They are not necessarily in accord with the views of the editor and other staff members or with the policies of the A.L.P.O. They may even contradict such staff opinions and also each other.

Honors Achieved by Young A.L.P.O. Members. The primary purpose of the A.L.P.O. is to encourage qualified amateur astronomers to undertake observational, and in part related theoretical, studies of the moon, the planets, and comets, to evaluate critically such studies, and to publish the results. A byproduct is the training of members of the Association to make such observations. Yet this secondary function may be important and has sometimes shown its effectiveness. From this point of view it is most gratifying that three A.L.P.O. members were among the forty national winners in the recent Science Talent Search for the Westinghouse Scholarships and Awards. They were Mr. Clark Chapman of Buffalo, New York, Mr. Joseph Eyer of Philadelphia, Pennsylvania, and Mr. Jack Hills of Independence, Kansas.

The three winners were in Washington, D.C., from February 28 to March 6, 1962, on an expense-paid trip to the Science Talent Institute at the Hotel Statler Hilton. They had a tremendous time! They visited scientific laboratories in the Washington area, talked with famous professional scientists and with other winners, placed exhibits of some of their scientific work in the Presidential Ballroom of the hotel, and met President Kennedy at the White House.

During the Institute all forty were judged in competition for the highest scholarships. Joseph Eyer won the third-place scholarship award of $5,000 and was runner-up to the second-place scholarship of $6,000. His research report, "A New Corrector for Astigmatism," described his new method for correcting astigmatism in the construction of two types of telescopes. His new "corrector" system is easily manufactured in contrast to other methods which are commercially impractical for the purpose. Jack Hills won a $250 award for an investigation of the atmospheric currents of Jupiter, applying the theory of least squares to his analysis of central meridian transits. Clark Chapman won a $250 award for his paper on his observations of Mars and Jupiter.

Clark writes: "I am sure that a primary factor in the success of Jack and myself was our membership in the A.L.P.O. And surely the A.L.P.O. has been an important factor in Joe's developing career." We are, of course, extremely glad for whatever assistance we have been able to give these three talented and outstanding young members.

Lunar Training Program and Recorder. In our reorganization of the A.L.P.O. Lunar Section we have appointed a second Lunar Recorder in charge of a Lunar Training Program. He is:

Clark Chapman
2343 Kensington Avenue
Buffalo 26, New York

Mr. Chapman directs the following message to all interested readers:

"I have been asked to take on the Recordership of the Lunar Training Section. As has been obvious to many A.L.P.O. members, the haphazard methods of observing the moon carried out by many A.L.P.O. members in the past are not worth-while. In the Lunar Training Section we will try to improve observers' methods of drawing and observing, and we will guide them into scientifically useful studies. Some of the objectives of this Section are listed below:

(1) New observers will be shown how to make more accurate and more realistic drawings of lunar features. Observers will be asked to use copies of general outlines from the Photographic Lunar Atlas, which will be supplied by this Section, as the basis for drawings of larger features. A standard reporting form will be adopted by the Section. The early drawings of new members will be constructively criticized.

(2) More advanced observers will be shown different types of study which can be undertaken. The general methods of doing special projects not being specifically worked on in the Special Projects Section will be discussed. This part of the Section will be emphasized. Random drawings of random craters will not be encouraged after observers have mastered drawing techniques.

(3) Training in the use of filar micrometers, photography, color filters, and other special methods of observing the moon will be undertaken with those observers having the necessary equipment.

(4) Until and unless another Section is set up for the primary purpose of analysing random observations, the Training Section will serve as the clearinghouse for various lunar drawings. The Section will not attempt to analyse such random drawings but will give them to the proper persons for analysis. Lunar observations should all be used and should not just be filed away and never studied.

"I will be happy to hear from any A.L.P.O. member having ideas on how the Section should be run. In the near future I will print up some helpful material on techniques of observing the moon which will be distributed free to any interested observer."

The Editor has felt for some years that such a training program is much needed. With the coöperation of members it can become an important and rewarding activity of the A.L.P.O.

In Our Next Issue. The May-June, 1962, Strolling Astronomer will contain Clark Chapman's second article on the Simultaneous Observation Program, another article from David Meisel on the recent Comet Burnham, a description and interpretation of A.L.P.O. Venus observations in 1960 and 1961, some pages of Jupiter drawings in 1961 prepared by Phil Glaser, and other items. You will greatly enjoy this issue.

PROGRESS REPORT ON THE COMING A.L.P.O. CONVENTION AT MONTREAL

By: Walter H. Haas

The Tenth Convention of the Association of Lunar and Planetary Observers will be held at Montreal, Quebec, Canada, on August 31-September 3, 1962. Our hosts are the Montreal Centre of the Royal Astronomical Society of Canada. A tentative program of events follows:

Friday,	August 31,	8:00-10:00 P.M.	Centre Observatory open for visitors.
Saturday,	September 1,	8:00-12:00 A.M.	Registration. Sightseeing tour and shopping.
		1:30- 5:00 P.M.	Welcoming talks. First paper session.
		8:00-10:00 P.M.	Visit to Centre's Observatory.
Sunday,	September 2,	morning.	Free for religious services, etc.
		1:30- 5:00 P.M.	Second paper session. Convention group photograph.
		6:00- 8:00 P.M.	Buffet supper. Presentation of an A.L.P.O. award.
Labor Day Monday,	September 3,	9:00-12:00 A.M.	Third and last paper session.

The group photograph will be taken by Mr. William E. Shawcross, Assistant Editor of Sky and Telescope. He has performed this service at several past astronomical meetings, and we are indebted to him for his help.

There is enclosed in this mailing envelope a registration form. It should be filled out and returned as soon as possible to Walter H. Haas, Pan American College Observatory, Edinburg, Texas. The deadline for receiving this form is July 14, 1962.

The Convention Chairman is Mr. W. A. Warren, 30 52nd Ave., Lachine, Quebec, Canada. He will answer general inquiries.

Mr. Clark Chapman, 2343 Kensington Ave., Buffalo 26, New York, has kindly agreed to take charge of the A.L.P.O. Exhibit. His fine work with our exhibit at Detroit in 1961 will be remembered by all those who saw it. Mr. Chapman requests that A.L.P.O. members send him material for display at their early convenience--time does slip along. Drawings, photographs, and charts of lunar and planetary subjects are suitable items.

The Laurentien Hotel, one of the largest in downtown Montreal, has set aside a block of room for attending A.L.P.O. members and their families and companions. They will hold this block of rooms until July 31, 1962. Persons wishing to stay at the Laurentien should make their reservations directly by writing to Mr. Norman M. Boyd, Hotel Laurentien, Montreal, Quebec, Canada. Experience has shown that it adds much to an astronomical meeting when the participants stay at the same place and that hotels are very suitable headquarters.

As of March 30, Mr. Warren and his Committee members had not yet chosen a place for the meetings. They were investigating both the McGill Physics Building and Sir George Williams University. [Mr. Warren further wrote that snow was rapidly disappearing in Montreal on this date, with only a foot or so in some places.] The registration fee will be set to cover costs after necessary arrangements have been made.

U.S. citizens entering Canada are reminded to carry some kind of proof of citizenship, for example birth certificates.

A program of papers is gradually taking shape. Among the papers so far scheduled are:

1. "New Vistas in Astronomical Optics," lecture by Dr. Alberic Boivin, Laval University, Quebec.

2. "Lunar-Type Terrestrial Vulcanoids," by Patrick Moore.

3. "The Nature of Jupiter's Atmosphere," by Walter Murawski.

4. "The Reduction and Elimination of Instrumental and Atmospheric Effects using Glare Screens and Filters," by Rodger W. Gordon.

5. "The Scientific Conscience," by Robert M. Adams.

6. "Planetary Colorimetry, 1962," by Charles H. Giffen.

Other papers are expected from Joseph Ashbrook, Philip Glaser, Joel Goodman, and Clark Chapman.

The eventual final list will be much longer.

This meeting at Montreal will be the first time that our A.L.P.O. has held a Convention by itself. Your support with ideas, papers, and exhibit materials and, if possible, your attendance are thus particularly requested. This Convention will be, to our knowledge, the first time that an American amateur astronomy group has met outside of the United States, surely a proper development. Skies allowing, Jupiter and Saturn will be available for observation in the evening sky during the Convention.

Though essential, these things cited above are certainly not the best part of astronomical meetings. One remembers afterwards the stimulating informal discussions between paper sessions, very late (or very early!) coffee parties, the new friends one makes, the old ones whose acquaintance is renewed and refreshed with common memories, and some odd idea or two upon telescope design, instrumental procedures, or the like.

See you at Montreal!

THE ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS, 1947-1962

By: Walter H. Haas

With this issue we come to the fifteenth anniversary of the founding of the A.L.P.O. and the initiation of this periodical. Both were born in March, 1947. It is gratifying that many of the "charter members" are still members, namely these: David P. Barcroft, Dr. Albéric Boivin, Ralph N. Buckstaff, Charles Cyrus, Charles A. Federer, Dr. James Q. Gant, Jr., Fred M. Garland, Walter H. Haas, Theodore R. Hake, Lyle T. Johnson, Russell Maag, Hal Metzger, Oscar Monnig, Dr. Robert Lee Moore, A. W. Mount, Elmer J. Reese, David Rosebrugh, Milton Rosenkotter, J. Russell Smith, Howard D. Thomas, Dr. Clyde W. Tombaugh, Frank R. Vaughn, Jr., and the Yakima Amateur Astronomers--a surprisingly large number from the few dozen members we had 15 years ago. A number of other friends of those early days now live only in our memories.

In a period of history characterized by rapid and violent changes everywhere astronomy is not what it was in 1947, nor even lunar and planetary astronomy as pursued by amateurs. No doubt the most striking change is the beginning of Man's pentration of space. In 1947 it was definitely scientifically risqué to speak of space flight, unless in the vaguest terms and not before future centuries; in 1962 great sums of public money are being spent to achieve manned exploration of the moon. The corresponding government subsidization of professional astronomy and job opportunies of many kinds for persons with some astronomical background are in great contrast to what was true 15 years ago. In 1947 the average amateur used a 6-inch reflector and often searched hard to learn of sources of telescopic accesories he wanted; in 1962 he frequently employs 8- to 12.5-inch telescopes and has a wide choice of goods from competing commercial companies. In 1947 many amateurs lived and worked alone; in 1962 there is a greatly increased number of astronomy clubs and of national and regional annual conventions. In 1947 the methods of observational and analytical lunar and planetary amateur astronomy were largely the classic visual techniques of several preceding decades; in 1962 there is much talk (though much more talk than actual performance) of replacing these with more sophisticated methods such as photography, photometry, micrometric measures, radio telescope studies, electronic computer reductions, and the like.

I have noticed much concern among many of our members as to how the A.L.P.O. can assist professional scientists in space research. I have also noticed much concern about our relations with professional astronomers and about how we can have our work "accepted" by them. These are not easy questions, nor should we expect simple answers. It is hardly the function of amateur astronomers to compete with large agencies spending vast sums of federal money on complex space programs. If and when we reach a day of continuous close-up television surveillance of every planet, then what the amateur may do from the earth's surface is scientifically slight. Our avocation would presumably have value for little but training observers, learning techniques, and personal pleasure. That day is not here yet, however; and we may well be entering a period when the reliable amateur observer is potentially of great value to the professional research space scientist, whose specialty is often not astronomy. How well the potential is to be realized will naturally depend upon cooperation on both sides. It may be significant and symptomatic that the A.L.P.O. was recently requested to participate in a well-known coming space experiment.

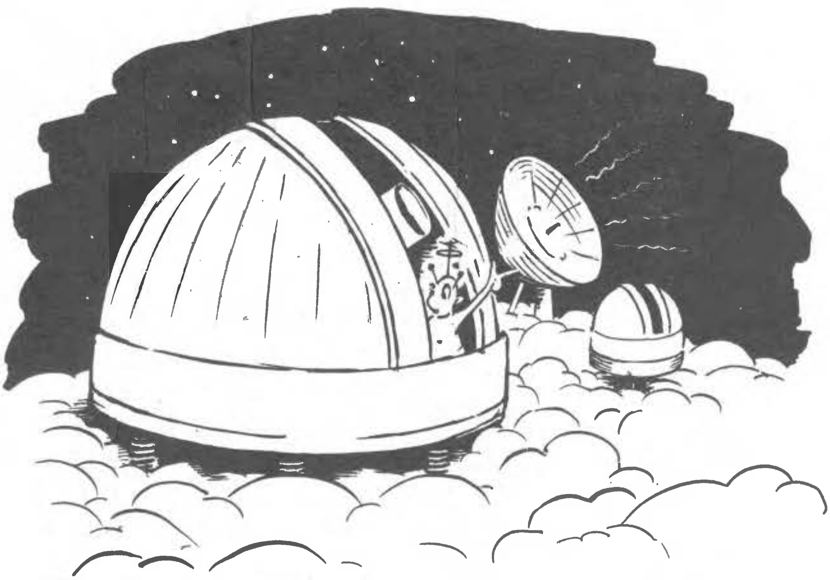
I have noticed in recent years a substantial amount of criticism from some of our members of the methods and results of lunar and planetary studies. To some extent, perhaps, we merely have here that youth is again discovering the failures of previous generations. However, in so far as we are showing an increased capacity for objective self-criticism and for recognizing our limitations, this trend is a very fine thing. Ability to evaluate and to weigh objectively are important assets to any scientist. We know, of course, that the A.L.P.O. can be improved in many ways. After 15 years of operation, we still find our observations too often to be small in quantity (regularly with planets visible only after midnight) and disappointing in quality (as with highly discordant sketches of Venus with small apertures). We have not solved the problem of needed rapid communication between active observers, and amateur radio has failed to show that it is the answer. We have established an A.L.P.O. Library, but it is still used much too little. The growth of some of our observational programs makes effective worldwide cooperation more important than ever, but observational contributions from colleagues overseas have declined since our early years. Nor have we worked out details of really effective liaison with lunar and planetary groups in other countries.

What we have achieved during our first 15 years has been possible only because of many different kinds of help from many different people, far more than can be mentioned. It has been a great pleasure to recognize the work of some of our friends with the nine A.L.P.O. Awards given to date--to Dave Barcroft, Frank Vaughn, Tom Cragg, Elmer Reese, Alika Herring, David Meisel, Tom Cave, Clark Chapman, and Alan McClure. Others have assisted the A.L.P.O. in diverse ways--with observations, papers for *The Strolling Astronomer*, papers for Conventions, material for exhibits, ideas in correspondence, gifts to the A.L.P.O. Library, and even direct financial aid. We have greatly enjoyed our relations with our colleagues in the Astronomical League and the four A.L.P.O. Conventions we have held with them (Kansas City in 1957, Ithaca, N.Y., in 1958, Haverford, Penna., in 1960, and Detroit in 1961). We have also greatly enjoyed our relations with our colleagues in the Western Amateur Astronomers and the four Conventions held with them: Flagstaff in 1956 (First A.L.P.O. Convention), Pasadena in 1958, San Jose, Calif., in 1960, and Long Beach, Calif., in 1961. There was also, of course, the unique Nationwide Amateur Astronomers Convention at Denver in 1959. A special word is owed to the late Carl Richards, whose donation of his set of back issues made possible the first complete library file of The Strolling Astronomer, at New Mexico State University. Later David Rosebrugh supplied his set to create a second such file at the Library of Congress. We owe much to the interest and cooperation of our publishers, who have been (after the first year or so) the Stevens Agency at Albuquerque, New Mexico, the Bronson Printing Company at Las Cruces, New Mexico, and the Mercedes Enterprise at Mercedes, Texas. The assistance of David P. Barcroft as Secretary has been invaluable. From 1959 to the present Pan American College has furnished substantial secretarial help with the preparation and mailing of The Strolling Astronomer. And not least of all, for their contribution is instead most essential, we are grateful for the selfless and considerable contributions of our staff members, past and present, as follows:

Mercury Recorders--C. B. Stephenson, Donald O'Toole, Jackson T. Carle, Owen Ranck, Geoffrey Gaherty, Jr.

Venus Recorders--Thomas R. Cave, Jr., James C. Bartlett, Jr., William K. Hartmann.

Mars Recorders--D. P. Avigliano, Frank R. Vaughn, Ernst E. Both, Leonard B. Abbey, Jr.



"Of course we must send them congratulations - they've been observing US for fifteen of their orbits."

(Translation by Interplanetary Communications Commission)

FIGURE 10. Contemporary view of unidentified Planet X. The elevator observatories above the cloud cover and the use of radio receivers to transmit messages should be noted. Contributed by Edgar Paulton, Chairman Emeritus of Observing Group, Amateur Astronomers Association, New York City.

****

Jupiter Recorders--Elmer J. Reese, Edwin E. Hare, Ernst E. Both, Robert G. Brookes, Henry P. Squyres, Chester J. Smith, Phillip W. Budine, Philip R. Glaser.

Saturn Recorders--Thomas Cragg, Phillip W. Budine, Joel W. Goodman.

Uranus-Neptune Recorder--Leonard B. Abbey, Jr.

Comets Recorder--David Meisel.

Lunar Meteor Search Recorder--Robert M. Adams.

Lunar Recorders--Alika K. Herring, James Q. Gant, Jr., Walter H. Haas, Leif J. Robinson, Clark Chapman.

Secretary--David P. Barcroft.

Counsellor--Dr. Lincoln La Paz.

Librarian--Downey Funck.

Foreign Language Coordinator--Ernst E. Both.

Book Review Editor--J. Russell Smith.

The first 15 years of the existence of our Association have brought me great personal satisfaction and many deep rewards. Let us go forward then with constant efforts to improve the standards of our work on the moon and the planets. With the continuing support and cooperation of you, the members of the A.L.P.O., an active and fruitful future is assured.

JUPITER IN 1961 - PART II
(A Discussion of Selected Phenomena as Observed by A.L.P.O. Members.)

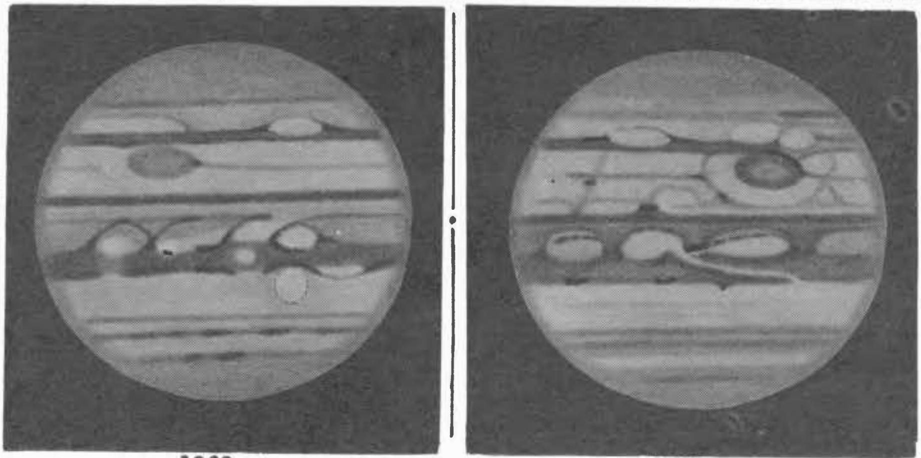
By: Philip R. Glaser

Perhaps the most interesting and unusual Jupiter apparition of recent years has just ended and while new observational material is being received by the Jupiter Section almost daily, your Recorder hopes that the following short discussion of certain unusual features of the planet's 1961 aspect may be of interest at this time. In particular, it is hoped that it will encourage our fine group of A.L.P.O. observers to resume systematic Jupiter study as early as possible in 1962 in order that the extensive and dramatic activity which has been evident in 1961 may be followed as closely as possible.

The Observers. There follows a list of the participating observers, based on reports received up to February 8, 1962.

Observer	Telescope(s)	Station
Larry Anthenien	6" refl.	San Jose, Calif.
S. W. Bieda, Jr.	6" refl.	San Jose, Calif.
Gil Bisjak, Jr.	6" refl.	Chino Valley, Arizona
Jean Paul Boudreault	5" refr.	Cap de la Madeleine, Quebec, Canada
Klaus R. Brasch	8" refl.	Montreal, Quebec, Canada
Phillip W. Budine	4",2.4" refrs.	Binghamton, New York
Arthur Burns	6" refl.	Barrington, New Jersey
Clark Chapman	10" refl.	Buffalo, New York
Douglas Cooke	4" refl.	San Diego, Calif.
Dale P. Cruikshank	12" refl.	Des Moines, Iowa
	4.3" refr.	Tucson, Arizona (?)
Charles M. Cyrus	10" refl.	Baltimore, Md.
René Doucet	5" refr.	Cap de la Madeleine, Quebec, Canada
Jean Dragesco	10" refl.	Le Vesinet, France
Jack Eastman	12" refl.	Manhattan Beach, Calif.
Stanley Emig	8" refl.	Leavenworth, Wash.
Stuart Emig	8" refl.	Leavenworth, Wash.

Observer	Telescope(s)	Station
Eugene Epstein	10" refl.	Hollywood, Calif.
Michael Evanick	3" refr.	Binghamton, New York
Joseph Eyer	8",2.4" refls.	Philadelphia, Pa.
Dick Fennelly	8" refl.	Greeley, Colorado
Geoffrey Gaherty, Jr.	8" refl.	Montreal, Quebec, Canada
Gary George	2.4" refr.	Binghamton, New York
Charles Giffen	19½",15.6" refls.	Princeton, New Jersey
Philip R. Glaser	8",6" refls.	Menomonee Falls, Wis.
Joel W. Goodman	10" refl.	Mill Valley, Calif.
Rodger W. Gordon	4" refr.	Pen Argyl, Pa.
Walter H. Haas	17",12½",6" refls.	Edinburg, Texas
William Haney	6" refl.	San Jose, Calif.
William K. Hartmann	12½",8" refls.	Tucson, Arizona
Edward H. Heilman	12½" refl.	Sarasota, Florida
Jack Hills	9", 8" refls.	Independence, Kansas
Harry Jamieson	10" refl.	Rock Island, Illinois
Craig L. Johnson	10½" refr.	Boulder, Colorado
Tom Joldersma	7" refl.	Holland, Mich.
David Jones	4" refl.	Corpus Christi, Texas
William Julevich	6" refl.	Stoughton, Mass.
Walter Kaminski	12½" refl.	Milwaukee, Wis.
A. C. Larrieu	8" refl.	Marseille, France
Jim Low	4" refl.	St. Lambert, Quebec, Canada
Donald Louderback	7" refl.	South Bend, Wash.
Russell Maag	6" refl.	California, Missouri
David Meisel	6", 8" refls.	Fairmount, W. Va.
E. C. Melville	10" refl.	Kingston, Jamaica
Dennis Milon	8" refl.	Houston, Texas
John Milne	2.4" refr.	Schnectady, New York
José Olivarez	2.4" refr.	Mission, Texas
Tom Osypowski	12½", 6" refls.	West Allis, Wis.
Tom Pope	12.5" refl.	Waukesha, Wis.
Ronald Powaski	6" refl.	Cleveland, Ohio
Elmer J. Reese	8", 6" refls.	Uniontown, Pa.
Charles L. Ricker	6" refl.	Marquette, Mich.
George Rippen	15.6" refr.	Madison, Wis.
Carlos E. Rost	12½", 10", 6" refls.	Santurce, Puerto Rico
R. W. Russell	2.4" refr.	Middleboro, Mass.
Takeshi Sato	6" refl.	Hiroshima, Japan
Herbert Seavey	12½", 6" refls.	Phoenix, Arizona
J. Russell Smith	16", 8" refls.	Eagle Pass, Texas
Charles Snell	6" refl.	Elizabethton, Tenn.
James Starbird	6" refl.	Topeka, Kansas
Ronald A. Story	6" refl.	Tucson, Arizona
Anthony Sunseri	6", 4" refls.	San Jose, Calif.
Raymond R. Thompson	4" refr.	Maple, Ontario, Canada
Richard F. Tompkins	8" refl.	Jenkintown, Pa.
Joseph P. Vitous	8" refl.	Berwyn, Illinois
Jerry Walsh	3" refr.	Brown Deer, Wis.
Gary Wegner	10" refl.	Bothell, Wash.
Richard Wend	12½" refl.	West Allis, Wis.
William J. Westbrooke	4" refl.	San Francisco, Calif.
David Williams	9", 6" refls.	Normal, Illinois
Fred Wyburn	8", 4" refls.	Red Bluff, Calif.
Richard Yelle	2.4" refr.	Methuen, Mass.
Stephen Zuzze	8", 6" refls.	Fresh Meadows, New York



1960 | 1961

2 July; 4^h 44^m Universal Time
CM I, 107° ; CMII, 4°
6-in. Refl.;240X; S,5;T,3
Drawn by Elmer J. Reese

8 July; 6^h 20^m Universal Time
CM I, 30° ; CM II, 336°
8-inch Refl.; 250X;S,4-5;T,4
Drawn by Elmer J. Reese

FIGURE 11. Comparative views of Jupiter in 1960 and 1961. A number of the major differences shown are discussed in Mr. Glaser's article in this issue.

****

EZ_s Belt. Two fine Jupiter disc-drawings done by Mr. Elmer Reese in 1960 and 1961 are printed side-by-side as Figure 11 above in order that some of these changes may more readily be appreciated. Perhaps the most striking of them is the very evident fact that in 1961 the great equatorial complex of belts, festoons, and bright ovals appears to divide Jupiter's visible disc into extremely unequal remainders. In fact, if you should judge simply from eye-estimate (or with the aid of a scale or dividers) that the south edge of this complex lies almost on the planet's equator, you would be quite right; and the question immediately arises: is this dark belt-like border at the south edge of the Equatorial Zone the true SEB_n? That is to say, is it the same belt shown near this latitude on Mr. Reese's drawing of July 2, 1960, which , in 1961, has become displaced, by some mysterious means, a considerable distance northward?

There is much disagreement among our most experienced observers on this point, as became evident at the time of our earliest available drawings and transit observations submitted in 1961 by Walter Haas, Carlos Rost, Clark Chapman, Geoffrey Gaherty, Dennis Milon, and Elmer Reese. Had this band been a rather faint belt in one of the polar regions, perhaps observers would have found it less annoying not to be able to identify it with certainty. However, it was relatively conspicuous, usually estimated to be only slightly less dark than the NEB and STB; and some designation had to be decided upon by the various observers for reporting purposes. Some of these descriptions were: SEB_n?, EZ-SEB_n, and S. border EZ; and it is interesting to note the three distinct interpretations implied by these designations. "SEB_n?" suggests that the belt is most probably a northerly-displaced SEB_n, "EZ-SEB_n" that it is a combined dark EZ and SEB_n, and "S. border EZ" that it is a new belt-like feature consisting entirely of a very dark southern portion of the EZ. At this time it cannot be determined which of these interpretations is correct. However, a good deal of helpful information has been supplied by A.L.P.O. observations.

In June the first 1961 photograph was submitted by Tom Osypowski, and measurements by both Mr. Reese and the writer confirmed the fact that the belt in question was indeed strangely situated for the true SEB_n, its south edge being near latitude 7°5 S. and thus very near the normal latitude for the <u>north</u> edge of the true SEB_n. Subsequently, Mr. Reese made a series of latitude measures from 9 new photographs by Dennis Milon, Tom Osypowski, and the writer; filar micrometer measures were made by Charles Giffen; and drawings were measured by Dale Cruikshank. These show that the 1961 <u>EZ_s Belt</u> had its center very near latitude 4°S., or much farther north than is indicated by available past data for the true SEB_n. It was noted, however, that during the apparition of 1919-1920 observers of the British Astronomical Association identified as the SEB_n a similarly displaced belt, as can be seen from examination of the fine illustration in Mr. B. M. Peek's <u>The Planet Jupiter</u> (Plate II, opposite page 65); and further insight was sought from transit observations. Thus, from a study of A.L.P.O. reports to December, 1961, Mr. Reese obtained 6 reliable rotation periods for dark projections on the south edge of the EZ_s Belt (one of which can be seen just to the left of the center of his Figure 11 drawing of July 8, 1961). Unfortunately, comparable data for past apparitions is rather sparse, due perhaps to a normal lack of suitable transit objects on the south edge of the true SEB_n. Still, the figures are of interest and look like this:

Rotation periods for objects on the S. edge SEB_n are:

1928-29 . . .	9^h	52^m	07^s	(10 spots) . . .	BAA
1942-43 . . .	9	52	28	(2 spots) . . .	BAA
1948 . . .	9	53	17	(4 spots) . . .	ALPO
1958 . . .	9	53	11	(7 spots) . . .	ALPO

Rotation periods for objects on the S. edge 1961 EZ_s Belt are:

1961 (to Dec.)	9^h	50^m	30^s	(4 proj.) . . .	ALPO
and	9	51	04	(2 proj.) . . .	ALPO

Thus we see that objects on the south edge of the EZ_s Belt are not rotating in periods that appear to be normal for the south edge of the SEB_n, and this perhaps lends credence to the interpretation that the 1961 EZ_s Belt is an unusual belt-like darkening of the southern edge of the EZ and that the few projections observed on <u>its</u> south edge are portions of the true SEB_n which is mostly obscured by an overlying atmospheric layer.

Perhaps in 1962 this interesting problem will be settled quite unequivocally by the reappearance of the fully darkened, true SEB_n, immediately to the south of the 1961 EZ_s Belt. If not, it is hoped that observers will make every effort to obtain as many transits as possible of any well-seen objects on the south edge of the EZ_s Belt.

<u>EZ Features</u>. Nor was this controversial EZ_s Belt the only confusing change in Jupiter's aspect to early 1961 observers. The well-defined NEB with its south-extending loop-festoons, which had been well seen late in 1960, was now completely unrecognizable; and, in the generally poor early views, it seemed to have grown into a single broad, dark belt, covering the entire equatorial section of the planet. Closer examination under favorable observing conditions, however, soon revealed that while the entire NEB-EZ had, indeed, become very much darkened, still the loop-festoons were there but in very much altered form. The 1960 dark, but delicate, loops themselves had either spread into, or were obscured by, the general darkening around them; and the conspicuous features were now large bright oval areas in the dark NEB-EZ.

Two important characteristics of these bright areas were recognized. First, their points of closest proximity lay on the south edge of the NEB where dark condensations, much like the darkened bases of some of the 1960 loop-festoons, could be detected; and second, the south borders of the bright EZ oval areas, again like the loop-festoons of 1960, extended only to the Equatorial Band, portions of which were clearly seen close to, but distinctly separated from, the north edge of the EZ_s Belt. So once again an interesting question presents itself. Can any of the dark condensations at the south edge of the NEB which are associated with the bright EZ ovals of 1961 be definitely identified as the same condensations which formed the bases of the 1960 loop-festoons? If so, a rather unusual longevity for features in this latitude might be established which could stimulate much interesting speculation.... For example, is it possible that what we have come to think of as random, ever-changing details, are, in reality, chance patterns made up of stable features in the EZ as they are revealed to us by rifts in a higher atmospheric layer which is in constant turmoil?... At any rate, the attempt to establish beyond reasonable doubt that certain EZ features retained their identity throughout 1960 and 1961 is now in progress; and all observers are urgently requested to search their records for previously unreported 1961 transits or drawings of EZ features, which should be sent to Mr. Reese at once. It is also of great importance in this study for us to secure transit observations as early as possible in 1962, for only in this way can long-lived objects be accurately identified. And, of course, as we have suggested above, particular attention should be given to obtaining accurate transit times for the centers of dark projections on the south edge of the NEB.

The Red Spot. If the aspect of Jupiter's "mid-section" presented interesting uncertainties to A.L.P.O. observers in 1961, this was indeed more than balanced by an almost unanimous agreement as to the great intensity and vivid coloration of the Red Spot. Such analysis of the observations as has been possible to date indicates that it had an extent of some 26° in longitude (slightly greater than in 1960), had a mean intensity near 3.9 (on the A.L.P.O. scale of 0 darkest to 10 brightest), and was usually judged to be orange or red-orange in color. It was almost always described in the cover letters of reporting observers as "the darkest I have ever seen it," and both visual observations and photographs found it to be quite invisible with red filters such as Wratten #25. The writer was also able to obtain several color photographs on Ektachrome film with a 12½-inch reflector on which the Red Spot showed up strongly and as distinctly orange in color. On close examination this general bright orange color-impression seems to have been due to the fact that the RS actually had a rather wide and rather dark red-orange outer border and a lighter interior of almost yellowish tint. This distinctly lighter interior was often seen by J. Russell Smith, Clark Chapman, and others who had also noted RS interior detail in 1960. Observers with much smaller instruments, however, quite often saw such internal detail in 1961, particularly during what appears to have been a rather general period of fine "seeing" (in the USA) during early August, when the "doughnut" appearance even registered on some photographs made with instruments as small as 8 inches in aperture.

Certain Red Spot-associated phenomena were also of unusual interest. One of these is shown on the drawing of July 8, 1961 (Figure 11) where the very dark south-following shoulder of the Red Spot will be noted. Many observers saw this simply as an extension of the STB which thus appeared to curve northward around the RS shoulder. Fine views, however, revealed the true situation to be considerably more complicated, with three circumstances combining to give the illusion of the north-curving STB. The first of these was that throughout most of July the long-enduring STB oval, FA, was approaching conjunction with the Red Spot (the following or second oval immediately south of the RS in this drawing); and of course this fact, by contrast effect if for no other reason, made the RS shoulder appear very conspicuous. Secondly, the STB itself was very conspicuous preceding FA, but doubled and faint following the oval, which did not encourage the eye to see it as a continuous belt. Lastly, FA was much less clearly defined than is usual under good observing conditions when one of the three STB long-enduring ovals is approaching conjunction with the RS. Thus we have a third possible factor contributing to the STB "illusion": the presence of an unusual obscuring haze which may have affected the area during July, 1961. By early August, however, the dark material of the RS following-shoulder seems either to have broken up or to have become partially obscured; Phillip Budine and other experienced observers noted a row of intensely dark spots in the position formerly occupied by the illusory "northward curve of the STB." These spots can also be identified on photographs taken at that time by Dennis Milon and by the writer.

It may be rewarding for us to be on the alert for similar interaction effects when any of the long-enduring STB ovals are near the RS area in 1962.

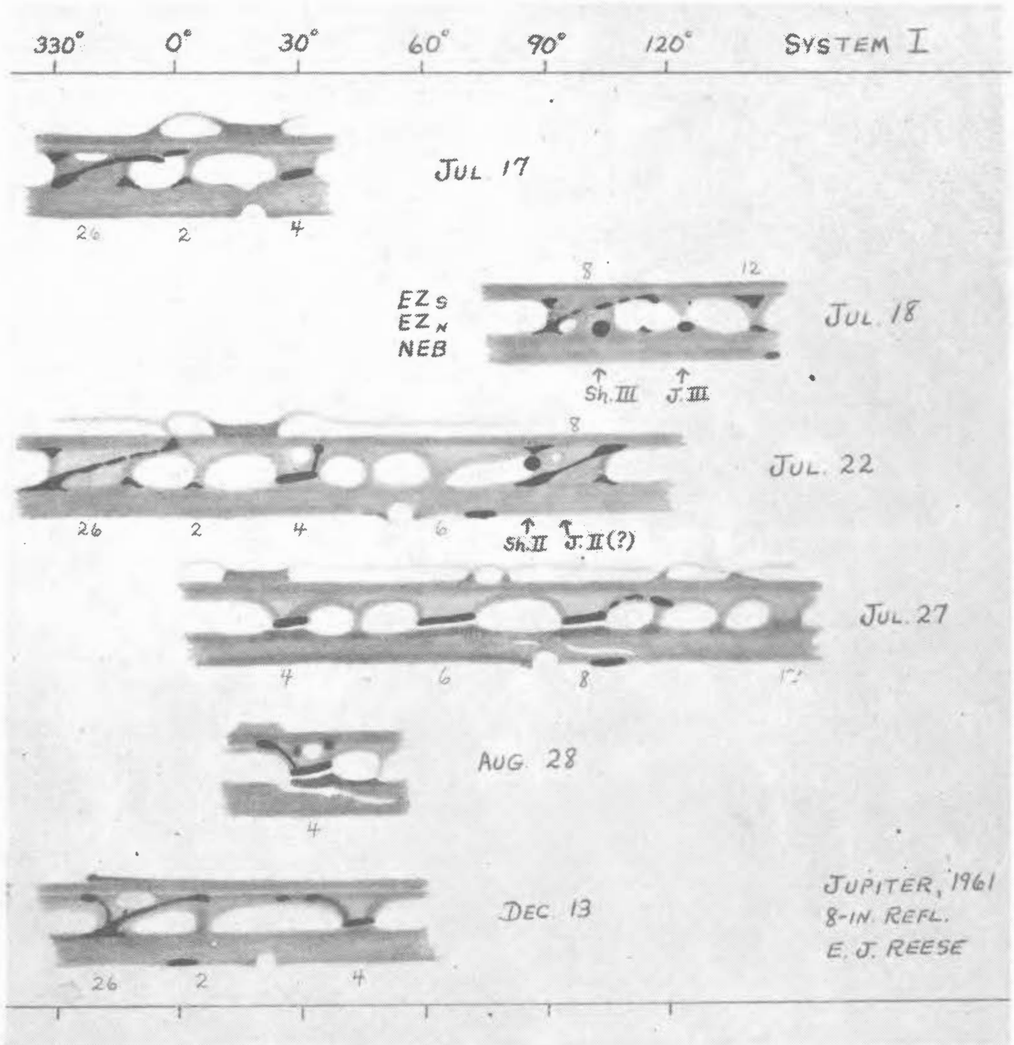
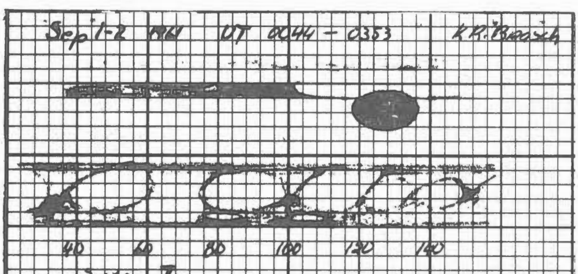


FIGURE 12. Above. Jupiter. System I features. Strip sketches by E. J. Reese show both changes and stability of some EZ features.



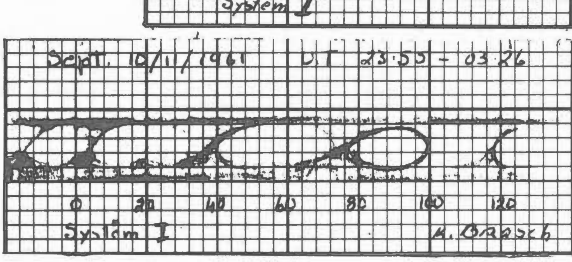


FIGURE 13. Strip sketches by K.Brasch. Note fading of projection on S. edge of NEB near 100°.

FIGURE 14. Photograph of Jupiter by Tom Pope, New Berlin, Wisconsin, on July 18, 1961, near 6^h 0^m, U.T., 12.5-inch reflector. Plus-X Film. ½ sec. exposure at f 90. Image size 6.2 mms. Developed for 5 mins. in D-19. CM_1=158°, CM_2=28°(about).

The very dark spot near the prec. limb is the shadow of III. J.III itself follows, projected on the S. edge of the NEB, and was evidently notably dark in transit. The oval Red Spot is prominent. Note the "activity" at the fol. shoulder of the Red Spot as STeZ Area FA nears conjunction with the Spot. See also text of Mr. Glaser's article in this issue.

****

STB Section Fades. Turning now to an examination of the 1960 drawing in Figure 11, we note that the STB is very dark and well defined across the entire disc. The bright oval here seen is BC; and upon turning to several of the 1961 drawings by other observers which are included with this article* we find another of the dramatic changes in Jupiter's more recent aspect. Now the entire section of the STB between FA and BC (some 100° in extent) has faded to near invisibility. Again, the cause of the fading may have been an extensive obscuration, since most experienced observers with good "seeing" and adequate instruments usually saw the belt as faintly doubled, or at least recorded as dark spots some of the projections on its south component. One group of three such spots was recorded photographically at the same time that visual observations of the same objects were being made at widely separated locations by David Meisel and Richard Wend.

While this faded section of the STB perhaps cannot be correctly described as unusually "disturbed" in 1961, still it most definitely did present a change from its 1960 aspect. Therefore it may be of some interest to note here that from the published data which the writer has seen it would appear that Jupiter's Main Radio Source was located in this area during the past apparition. We must, of course, regard very seriously the statements by most of the authorities in Radio Astronomy to the effect that no correlation between visually observable phenomena and strong radio emission from Jupiter has yet been noted; still, we are amateurs and should not lose sight of the fact that we are quite at liberty to engage in seemingly unprofitable investigations. Perhaps then, some A.L.P.O. observers may wish to take particular note of any well-seen features in the vicinity of Jupiter's Main Radio Source during 1962. If so, the following formulae for locating this source in System II are offered. Formula(1) is taken from the Ephemeris for Physical Observations of Jupiter near Conjunction compiled by Charlotte Krampe (Astronomical Journal, Vol. 65, No. 1227, pp. 104-106, March, 1960); and Formula(2) has been suggested by E. J. Reese and others and is based on data published by A. G. Smith in Science (Vol. 134, No. 3479, 1 Sept., 1961, pp. 587-595).

They are:

(1) $+0^\circ\!.2882$ (JD - 2435839.5) - $0^\circ\!.00166$ Δ, where JD is Time in Julian Days and Δ is the geocentric distance of Jupiter.

(This formula is based on a Main Radio Source period of 9^h 55^m $28^s\!.8$.)

(2) 360° - $0^\circ\!.2748$ (JD - 2434013).

(Based on a Main Radio Source period of 9^h 55^m $29^s\!.35$.)

Good Luck! And the Jupiter Recorders again wish to thank all contributing A.L.P.O. observers for their fine work in 1961.

*It has been necessary to defer the publication of most of these drawings to the May-June, 1962, issue.

ENCLOSURES IN THIS ENVELOPE

The following items are enclosed in this mailing envelope for all A.L.P.O. members. (They are in part omitted for a very few persons who have already received some of them.)

1. A Registration Form for the Tenth A.L.P.O. Convention at Montreal on September 1-3, 1962. It is important that this form should be filled out and returned to the Editor as soon as possible by everyone who expects to attend.

2. A descriptive, illustrated brochure upon the Pan American College Observatory and its programs. We appreciate the interest which many A.L.P.O. members have shown in Pan American College and its work in the astro-sciences and hope that this brochure will help supply useful information.

3. A green circular about two courses in the astro-sciences being offered at Pan American College during the 1962 Summer Session. These are intended particularly for teachers. Perhaps readers will show this circular to teachers who might be interested.

4. A picture postcard in natural colors of the main building at the Pan American College Observatory.

The new 1962-1963 Pan American College Catalogue will be ready in May and will be sent to interested persons upon request.

The Strolling Astronomer

SUBSCRIPTION RATES

Bimonthly Issue (in stock)	0.70
Trimonthly Issue (in stock)	1.00
6 Months - - - - - - - -	1.75
1 Year - - - - - - - - -	3.00
2 Years - - - - - - - -	5.00

ADVERTISING RATES

Full Page Display Ad	$40.00
Half Page Display Ad	22.50
Quarter Page Display Ad	15.00
Classified or Listing (per column inch)	4.00

Discount of 10% on 3-time insertion.

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.

ENJOY YOUR ASTRONOMY MORE . . .

WITH THESE SKY PUBLICATIONS

Sky and TELESCOPE

To maintain an active interest in astronomy, read SKY AND TELESCOPE, the world's largest astronomical magazine, now in its 19th year. Popular in style, yet informative, this well-illustrated publication serves the amateur and professional astronomer, the interested layman, and the scientist working in allied fields.

Each issue contains articles on the earth and the moon, the sun and its family of planets, and the entire universe of the stars and galaxies. There are notes from amateur groups, a telescope makers department, observing information, a section on satellites and space rockets, full-page photographs, up-to-date news items, and book reviews. Monthly star maps and planet charts prove invaluable aids at the telescope—or for naked-eye study of the constellations.

In the United States and possessions	$5.00, one year $9.00, two years $13.00, three years
In Canada and Pan-American Postal Union countries	$6.00, one year $11.00, two years $16.00, three years
In all other countries	$7.00, one year $13.00, two years $19.00, three years.

Norton's Star Atlas

By A. P. NORTON AND J. G. INGLIS

This famous star atlas and reference handbook is particularly suited for amateurs and students who desire sky charts in book form. It covers the whole heavens, showing over 9,000 stars to magnitude 6⅓, nebulae, and clusters. There are descriptive lists of 500 interesting objects for viewing with small telescopes, and useful data are given for observers of the sun, moon, and planets.

$5.25

Popular Star Atlas

By R. M. G. INGLIS

This compact, well-bound set of 16 maps is a simpler version of Norton's *Star Atlas* described above. All stars down to magnitude 5½ are included. This edition is excellent for field use by constellation study groups and by meteor parties. **$2.00**

Larousse Encyclopedia of Astronomy

By LUCIEN RUDAUX AND G. DE VAUCOULEURS

The long-awaited English translation of this monumental French volume—one of the most complete and best-illustrated compendiums of astronomy ever offered in one book. The detailed explanations, diagrams, and charts were designed for the reader wanting a thorough knowledge of the subject, yet having no previous introduction to astronomy. As a reference work it is unsurpassed. Many full-page color renditions. Full-page size is 8 by 11¾ inches.
506 pages, 818 illustrations. **$12.50**

Color Charts of the Moon

These two striking color charts of the first-quarter and last-quarter moon were drawn by Joseph Klepesta, the well-known Czechoslovakian amateur astronomer. Each lunar half is an impressive 27 inches in diameter; the over-all size of a chart, 23 inches wide by 33 inches high. Printed in predominantly gold and black on heavy paper. Mailed unfolded in a tube. **$2.00** per set of 2

Moon Sets

These 18 pictures, showing the entire visible face of the moon, are made from unsurpassed Lick Observatory negatives of the first and last quarters. Each print is 8½ by 11¾ inches with a white border. Small key charts are provided for the identification of lunar seas, mountains, and craters. Moon Sets are suitable for framing, or for use as an atlas. Each set is mailed in a protective heavy tube. **$3.00** per set

Lunar Crescent Sets

These 10 Lick Observatory pictures are a matching series to Moon Sets, but for the waxing crescent 4½ days after new moon, and the waning crescent about five days before new moon. The first two pictures show each crescent as a whole, and key charts are included to identify the lunar features, especially those near the moon's edge that are shown to better advantage than in Moon Sets. Four pictures are closeups of the waxing crescent, four of the waning; these may be cut out and put together to form mosaic crescents in which the moon's diameter is about two feet. Mailed in a protective heavy tube. **$2.50** per set

Elger's Map of the Moon

A large, canvas-mounted chart, 30 x 19½ inches, identifying all the important lunar features. Notes by H. P. Wilkins on 146 of the more interesting areas make it invaluable for serious study of the moon. **$3.00**

Lunar Map

In two colors and over 10 inches in diameter, the map identifies most important features on the moon, including 326 mountains, seas, and craters.

25 cents each; 3 or more, 20 cents each

Color Map of the Northern Heavens

This is a large wall chart, 30 by 34½ inches, colorful as well as informative. The northern sky to −45° is shown on a polar projection, and each star is colored according to its spectral class. Stars brighter than magnitude 5.1 are included. Mailed unfolded in a heavy tube. $1.00

Making Your Own Telescope

By ALLYN J. THOMPSON

Here are complete step-by-step directions for making and mounting your own 6-inch reflecting telescope at low cost. This telescope can use magnifications up to 300 times on the sun, moon, planets, stars, and galaxies. In easy-to-understand chapters, you will learn how to grind, polish, and figure the mirror, and how to make a reliable mounting which will provide a sturdy, solid support for your mirror. 211 pages, 104 illus. **$4.00**

Atlas of the Heavens

ATLAS COELI 1950.0

A striking advance in star atlases has been achieved by Antonin Becvar and his coworkers at the Skalnate Pleso Observatory, Czechoslovakia. The 16 charts cover the entire sky to stellar magnitude 7.75, showing double, multiple, and variable stars; novae, clusters, globulars, and planetaries; bright and dark nebulae; the Milky Way and constellation boundaries.

De Luxe Edition. Handsomely printed in many colors: blue for the Milky Way, yellow for star clusters, red for galaxies, green for planetaries and diffuse nebulae, gray for dark nebulosities. More than 35,000 celestial objects, including over 100 radio sources, are plotted, and the Bayer-letter and Flamsteed-number designations of the naked-eye stars are given. Positions can be accurately read by means of a transparent co-ordinate grid overlay. The 16 charts are permanently bound in a heavy cloth cover, 16½ by 23 inches, with color chart key on a foldout flap. **$9.75**

Field Edition. The most complete yet inexpensive set of charts for outdoor observing and use at the telescope. Each chart is reduced from the original Atlas Coeli and is printed on a heavy, stiff paper 18 by 12¼ inches. The stars are white on a black background, which may be illuminated with a flashlight without spoiling the observer's dark adaptation. Charts are shipped flat, unbound. **$4.00 each set, $7.50 for two**

Atlas Coeli Catalogue

By ANTONIN BECVAR

The most complete check list of celestial objects ever offered to the amateur observer. Listed, with descriptive data, are the 6,362 stars brighter than magnitude 6.26, with their right ascensions and declinations for 1950, precessions, proper motions, magnitudes, and spectra; 293 open star clusters; 100 globular clusters; 240 bright diffuse nebulae; 144 planetaries; 1,131 galaxies; some 1,750 visual double and multiple stars; and 633 variable stars bright enough for amateur observing.

Special tables list modern orbital data for 308 visual binaries and 458 spectroscopic binaries. Also included are Messier's famous catalogue of 109 nebulae and clusters, indexes of star names, precession and other convenient tables. Explanations are given in English. The sturdy cloth binding makes this 8¼-by-11¾-inch book easy to use at the telescope. 367 pages. **$8.75**

SKY PUBLISHING CORPORATION
Harvard Observatory · Cambridge 38, Massachusetts