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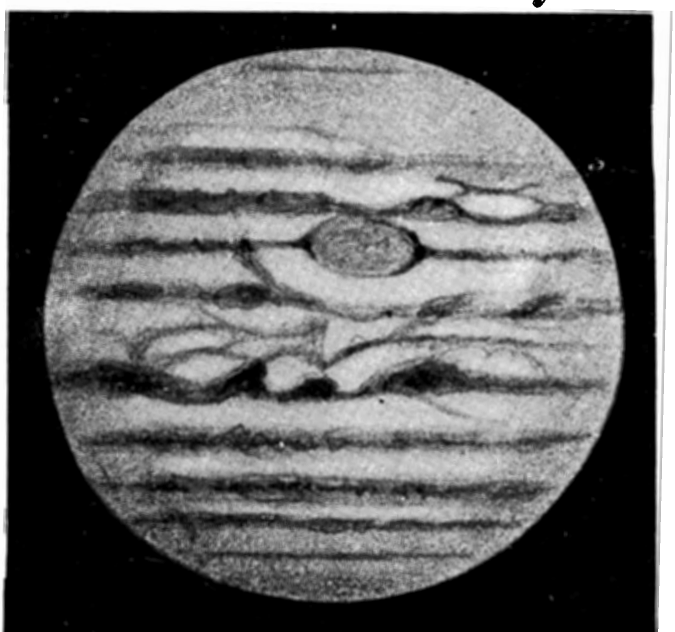
Tenth Anniversary Issue



JUPITER
May 1, 1957 4h 10m U.T.
12.5″ Rfl. 228X
S: 5—6 T: 3
CMI: 210° CM2: 302°
Alika H. Herring

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

In This Issue

THE A.L.P.O. FROM 1947 to 1957

by Walter H. Haas

The year 1957 marks the tenth anniversary of the founding of the Association of Lunar and Planetary Observers and of its periodical, The Strolling Astronomer. To commemorate this event, we are making this issue a special enlarged Tenth Anniversary Issue. At this writing we are not sure whether it will be a double double issue (four months) of 48 pages or a triple double issue (six months) of 72 pages. However, you can find this information on the front cover. We hope that you will like our special issue, and we also secretly hope that it will help us reduce the interval between the ostensible and the actual dates of publication.

The Strolling Astronomer began life in 1947 as a mimeographed lunar and planetary news-sheet sent to a few dozen astronomical friends. Bearing in mind the brief lives of many private astronomical publications and the wide margins of the early issues, I now realize that they were loyal friends indeed. Then, as now, any interested person was free to subscribe; and then, as now, membership in the A.L.P.O. and subscription to The Strolling Astronomer were identical. The A. L. P. O has always been a loose and informal group of chiefly amateur observers. All activities are on a volunteer basis; and no one is required to do anything, though we naturally like everyone to do as much as he can. (The one exception to this volunteer arrangement is that we do pay our publisher, now the Bronson Printing Co. of Las Cruces, New Mexico.) Our objectives are to stimulate, coördinate, and generally promote lunar and planetary astronomy among amateur astronomers - though professional astronomers are certainly also most welcome to participate.

It is pleasant to report that the following "charter members" are still members and thus have supported us through our first ten years: D. P. Barcroft, A. Boivin, R.N. Buckstaff, T. Connors, C.M. Cyrus, H. Dall, C.A. Federer, J. Q. Gant, Jr., F.M. Garland, W.H. Haas, T.R. Hake, L.T. Johnson, R.C. Maag, H. Metzger, O.E. Monnig, R.L. Moore, A.W. Mount, E.J. Reese, C.P. Richards, D.W. Rosebrugh, M. Rosenkotter, N.J. Schell, J.R. Smith, H.D. Thomas, C.W. Tombaugh, F.R. Vaughn, Jr., E.K. White, H.P. Wilkins, and the Yakima Amateur Astronomers.

Of course, the A.L.P.O. soon developed facets not forseen at its creation. One of these was the contribution of Strolling Astronomer articles from our members, Frank Vaughn being the first author-contributor. We have been fortunate in that these contributions have been very regular over the years, and in our opinion many of the articles submitted have had definite merit. Of course, we have not been able to publish all articles submitted, and probably we have not always chosen the best ones. We do try to publish all articles which report worthwhile observations or which offer new and thought-provoking interpretations of lunar and planetary phenomena. It is also gratifying that the A.L.P.O. has had from its earliest days a strong international cast. If it serves primarily American amateur astronomers, it still also serves the whole world. The contributions of our colleagues in England, Japan, Germany, France, and a number of other countries have been invaluable.

We have enjoyed a slow but rather steady growth in membership over the years. The few dozen members of our beginnings have now increased to approximately 450 members, scattered over almost every state and also over many foreign countries. The Strolling Astronomer has improved considerably both in its overall appearance and, more importantly, in the quality and quantity of its contents. It was a real triumph to begin to use illustrations in 1950. Mimeographing gave way to printing, which in turn yielded to an offset process to reduce costs.

Our Association has sometimes been described as a one-man project. Its political form has certainly been a dictatorship, I hope beneficent, like the American Meteor Society under Dr. C. P. Olivier. Basically, however, the A.L.P.O. has owed its existence and whatever success it has achieved to the unselfish help of many different persons. First of all, I must certainly mention our Secretary, Mr. David P. Barcroft, who has given most freely of his time in answering routine inquiries and in helping to administrate the A.L.P.O. Some of the inquiries have really not been routine, such as those of the lad who wanted to know all about the canals of Mars, the rings of Saturn, possible ultra-Plutonian planets, the red shift, and interstellar matter! We are also indebted to the Section Recorders, both past and present; and it seems proper to list their names here:

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

Venus - Thomas R. Cave, Jr., James C. Bartlett , Jr.

Mars - D. P. Avigliano, Frank R. Vaughn.

Jupiter - Elmer J. Reese, Edwin E. Hare, E. E. Both, Robert G. Brookes, Henry P. Squyres, Chester J. Smith.

Saturn - Thomas Cragg.

Uranus and Neptune - Leonard B. Abbey, Jr.

Lunar Meteor Searches - Robert M. Adams.

Moon - Alika K. Herring, James Q. Gant, Jr., and Walter H. Haas.

Our Sections are frankly modelled upon those of the British Astronomical Association. We do not, alas, appear to be able to find such extremely durable Section Heads as the B.A.A. possesses, perhaps in part because of the fluidity of modern American life. Each A.L.P.O. Section Recorder directs the work on his particular planet or speciality. He seeks to encourage new observers, to help old ones to do better work, to gain recruits for his Section, to exchange ideas and observations with similar groups abroad, etc. By no means least of all, he reports results at suitable intervals in The Strolling Astronomer. We are also much indebted to those who have contributed lunar and planetary observations. The work of such men as Elmer Reese, Tsuneo Saheki, Edwin E. Hare, Shirō Ebisawa, and many others can only incite our deep admiration. Some of our members, e.g. Dr. James Bartlett, John E. Westfall, and Richard Baum, have done amazingly good work with only three - or four-inch telescopes. However, it is also very good to be able to report that the average aperture employed by A.L.P.O. members has increased during the last ten years. In 1947 the six-inch reflector was much the most common A.L.P.O. instrument, and very few 12-inchers were mentioned in observational reports. In 1957 there are a very fair number of 12½-inch reflectors among our ranks and some 16-inch reflectors; occasionally a few lucky members observe with really large professional telescopes. Finally, the A.L.P.O. is indebted to many persons for assistances of various kinds, for postage stamps in our early days, for advice of all kinds, for occasional small donations, for favorable publicity in national magazines, etc. To one and all I here say - Many Thanks.

In 1954 the A.L.P.O. became an Affiliate Member of the Astronomical League. We look forward to holding our Second Convention with our friends in the League at Kansas City, Missouri on August 31 - September 2, 1957 (see below under "Announcements").

In 1956 we held our very first Convention at Flagstaff, Arizona, thanks to the generous help of the Western Amateur Astronomers. So enjoyable were the joint Conventions of the two groups that attendees even forgave Mars its lack of detail, the result of an abnormally obscured Martian atmosphere combined with some singularly bad seeing in our own atmosphere.

We have dwelt here on the past. What of the future? How can the A.L.P.O. and The Strolling Astronomer improve their services? What are some reasonable and attainable goals?

First of all, there is a need for more and better observations. Perhaps 10 percent of us do almost all the observing. We have covered such a simple field as recording Jovian central meridian transits inadequately in recent years, and we failed almost completely to observe two passages of the satellites of Saturn through a variable star field in 1956. More photographic lunar and planetary work is also needed, particularly by members suitably equipped with larger telescopes. The present generation of amateur lunarians and planetarians have almost forgot that there is such a thing as a filar micrometer; but this instrument allows the determination of latitudes on Jupiter and Saturn, longitudes off the central meridian on Jupiter, and heights of lunar features. Also, observers should sometimes explore possible new techniques in lunar and planetary work, such as image converter tubes.

There is a need for rapid communication among active observers, especially when such unforeseen and exciting events as an apparent obscuration of Plato floor detail or an unusual prominence of the dark hemisphere of Venus require immediate attention. This communication will presumably be via amateur radio stations, but the details are still to be worked out.

Certain simple projects could perhaps be carried out with the help of one sufficiently interested person. A library and a librarian seem desirable; the very new International Lunar Society already has both. A lantern slide library could be most helpful to our members who lecture on lunar and planetary subjects. It would be excellent to develop a system of abstracting articles of lunar and planetary value in scientific journals, including those in languages other than English.

A closer liaison with active lunar and planetary groups in foreign countries must somehow be achieved. The International Lunar Society, founded in 1956 with Dr. H. P. Wilkins as President, is here an example of a truly international society. There is a need for a standardized nomenclature for the belts and zones of Jupiter and Saturn and for the minor divisions in the rings of Saturn; there is a need for an internationally accepted scale of numerical intensities for the markings on each bright planet. Possibly something can be done in this direction at the proposed international meeting of amateurs in France in 1961. There is certainly some substantial duplication of effort among the different national observing-groups; and perhaps it would be ideal if all work on Mars went to one worldwide clearing-house, all work on Jupiter to another, etc.

In closing, I want to thank each and every one of you for your help in making the A.L.P.O. what it is. With your continuing help, I am sure that our second decade will be one of further progress. And if we may be permitted a fantastic dream, let us plan our 1967 Convention at the Institute of Lunar and Planetary Sciences in the Nowhere Mountains on Seeing-Ten Peak in the dome of the Nosuch 30-inch refractor.

ANNOUNCEMENTS

Convention at Kansas City. The Astronomical League will hold its 1957 Convention at Kansas City, Missouri on August 31, September 1, and September 2. We are especially interested in this event because much of Labor Day Monday, September 2, will be given to the Second Convention of the Association of Lunar and Planetary Observers. The site is the campus of the University of Kansas City. The Registration Chairman is Mrs. Helen Edwards, 7217 Madison, Kansas City, Missouri; and the registration charge is \$2.00 per person or \$3.50 per family after July 31.

An excellent and even crowded program is shaping up, with emphasis on the I. G. Y. and on Moonwatch. The main speaker is Dr. Richard Thomas of the National Bureau of Standards at Boulder, and his subject is "Some Current Problems of the Solar Chromosphere." Dale Cruikshank of Des Moines and others will give instructions in planetary observation. Charles Federer of *Sky and Telescope* will be chairman of a panel to answer questions. There will be other speakers, astronomical exhibits, and a banquet. The A.L.P.O. part of the program so far includes almost a dozen papers on Mars, Mercury, the Moon, lunar meteor searches, and Comet Arend-Roland; and additional papers are expected.

We hope very much that all who can will descend on Kansas City over the Labor Day week-end. We are sure that you will find the League Convention astronomically stimulating and personally most enjoyable.

Twentieth Meeting of Meteoritical Society. This event will be held on September 3 and 4, 1957 on the campus of the University of California at Los Angeles. The program will include a lecture "Parade of the Milky Way" at the Griffith Planetarium and an excursion to Palomar. Persons wishing to contribute papers should contact the Program Chairman, Dr. Frederick Leonard, Dept. of Astronomy, U.C.L.A., Los Angeles 24, California.

The Meteoritical Society is primarily a professional group, but amateurs seriously interested in meteoritics are welcome to membership.

On Radio Communication. Mr. C. L. Stong, who now edits "The Amateur Astronomer" in Scientific American magazine, urges us to try to make radio communication among active observers a reality. He points out that the names, call letters, towns, and street addresses of radio "hams" may be found in "Radio Amateur Call Book", published at 608 S.Dearborn St.,Chicago 5, Illinois. It sells for about two dollars and is brought up to date every quarter.

The First Journal of the I.L.S. Volume I, Number 1 of the Journal of the International Lunar Society appeared in March, 1957 and was very well worth waiting for. The front cover is a splendid photograph by Dr. Dinsmore Alter of the lunar craters Ptolemaeus, Alphonsus, and Arzachel, taken with the Mount Wilson 60-inch reflector on October 26, 1956 at colongitude 177°.5. The articles are in English with abstracts in French, German and Spanish, though we understand that the general policy is that articles are to be either in the language of the author or in one of the four tongues just mentioned. The first issue of the new Journal contains an editorial foreword, a description of some "Lunar Puzzles" by Robert Barker, a discussion of "A Photo-Visual Observation of an Impact of a Large Meteorite on the Moon" by Leon Stuart, Part I of a catalogue of lunar domes, two other main articles, some news notes, and a list of Fellows of the I.L.S. The President of the Society is Dr. H. P. Wilkins. The Secretarial address is: Professor Antonio Paluzíe-Borrell, Diputación 337, Barcelona, Spain. Fellows receive two Journals and four Bulletins a year for the modest sum of ten shillings (about $1.40 in American money). The Journal is illustrated.

We extend our best wishes for a bright future to the International Lunar Society.

Saucers. This periodical is published about four times a year by one of our members, Mr. Max B. Miller, P.O. Box 35034, Los Angeles 35, Calif. The spring of 1957 issue contains 16 well-filled pages of current and past reports on unidentified flying objects. It is, of course, in the interpretation of these reports where violent differences of opinion arise. Author Miller impresses us as a very honest reporter, something certainly essential for the possible eventual solution of the "saucer mystery" of our times. We think that Saucers will be interesting and rewarding to all who follow this general subject. The price is 25 cents per issue, $1.00 for four issues, and $2.00 for eight issues.

MARS, 1954 - REPORT NUMBER 3

by D. P. Avigliano

This final Report on Mars in 1954 is based on A.L.P.O. observations covering the period of July 28, 1954 to the first part of November, 1954. Several observers were able to observe the planet after November but the amount of observations received decreased rapidly after the first part of November. During this period the diameter of Mars decreased from 19.8 on July 28 to 8"9 on November 10. The areocentric longitude of the sun or L.S. increased from 204°.1 to 270° during the same period. Thus the S. hemisphere of Mars went through mid and late spring while the N. hemisphere went through mid and late autumn.

The Southern Hemisphere. The breaking up of the S. Maria into smaller details was noted as the season progressed. The S. polar cap continued to decrease in size and was noted to develop an increasing number of knots in the dark melt band surrounding it. A number of observers noted rifts within the cap. Figure 1 on pg. 6 shows five drawings of the same general side of the S. hemisphere of Mars as seen periodically from May 20, 1954 to November 10, 1954. The drawings C, D and E cover the period of this Report. Note the decreasing size of the polar cap along with changes of detail in the Maria. The Hellespontus and Hellas regions should be especially noted. The dark melt band surrounding the S. cap was seen by our observers on each day of this Report from July 28 to the first of September and then, due mainly to a decrease in the amounts of reports received, it was seen only periodically till the end of October. It would appear that it was present on all the days covered by this Report.

Clouds, Obscurations and Light Areas. Listed here are only the clouds, etc. that were observed on more than one occasion or by more than one observer during the dates of this Report. The list is in order of date. The observer's name is given after each description. (bt. - bright, w. - white, prom. - prominent, cld. - cloud).

July 28, Very bt. w. over general Zephyria area on limb (Doucet).
July 29, Very bt. w. area over general Zephyria-Aeolis areas (Doucet).
July 30, W. area over Zephyria-Aeolis areas (Doucet).
July 30, Isidis and Neith Regio whitish (Haas).
July 31, Isidis and Neith Regio whitish (Haas).
Aug. 1, Yellowish-w. cloud on limb over Aeolis (Avigliano).
Aug. 3, Yellowish-w. cloud on limb over Aeolis (Avigliano).
Aug. 4, Bt. w. cld. over Aeolis (Bartlett).
Aug. 4, The Zephyria-Aeolis clouds were confirmed on photographs taken by Lyle T. Johnson on this date (fairly prominent even in yellow and red-orange photographs).
Aug. 7, Aeolis bt. spot seen near terminator (Bartlett).
Aug. 8, Aeolis bt. spot seen on terminator, possibly projecting (Bartlett).
Aug. 12, Dull w. cld. on limb in general Ulysses area (Avigliano).
Aug. 15, W. cld. on limb in general Ulysses area (it appeared to project from limb at 5:40 U.T.). (Avigliano).
Aug. 16, Dull w. cld. in general Ulysses area on limb (Avigliano).
Aug. 17, Wide spread obscurations over desert regions, disc at C.M. 121°. (Cave).
Aug. 18, Candor and Tharsis whitish (Haas).
Aug. 19, Widespread obscurations over desert regions, disc at C.M. 108° (Cave).
Aug. 21, Cld. in Tharsis (Cragg). Tharsis appeared obscured, C.M. 106° (Avigliano).
Aug. 22, Clouds in Tharsis (Cragg). Detail obscured in Tharsis (Avigliano).
Aug. 27, Candor-Tharsis bt. (Ebisawa).
Sept. 3, Isidis Regio brilliant w. (possibly cld.) (Bartlett).
Sept. 3, Very bt. light yellow cld. in Libya (Avigliano).
Sept. 4, Isidis Regio brilliant w. (Bartlett).
Sept. 4, Libya area a lighter yellow than normal (Avigliano).
Sept. 13, Aeolis bt. w. (possibly cld.) (Bartlett).
Sept. 15, Aeolis bt. w. (Bartlett).
Oct. 1, Candor-Tharsis areas dull whitish (Haas).

The Nodus Laocoontis Area. Along with this Report we are printing several of the 1954 drawings that show the Nodus Laocoontis - Thoana Palus development (Figures 2 to 5). These drawings will supplement the previous report on this area (Str. A., Vol. 9, Numbers 1 and 2, Jan.-Feb. 1955) and some of the drawings of other observers that were printed in several of the 1955 editions of Str. A.

Smaller Apertures. There were many reports received in 1954 from observers using smaller telescopes (3 to 5 inches in aperture). Some of the work done with these instruments was of exceptional quality. Among our observers who used these smaller instruments the following should receive special notice for their most helpful work: Adams, Doucet, Dove, Westfall, Bartlett, Baum, Budine, and Lenham. Figure 6 shows a drawing by Baum made with 4½" of aperture.

This Recorder wishes to thank each of the observers who made possible this series of Reports on Mars in 1954. Reports were received from 18 of the 48 states and from Washington, D.C. Foreign reports came from 11 different countries or provinces. It has been a great pleasure indeed to work with the A. L. P. O. and with its Director, Mr. Walter H. Haas.

MARS, 1954 - CANALS AND OASES

by D.P. Avigliano

Canals. The following is a complete list of all the confirmed canals seen in

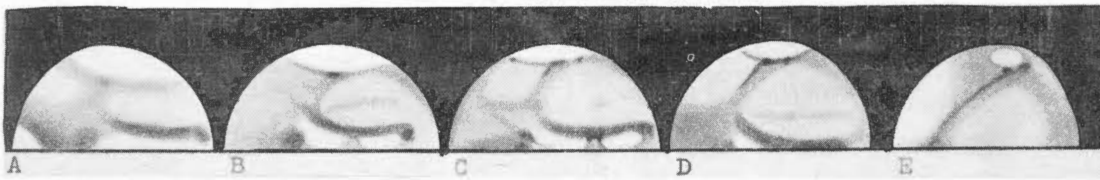


Figure 1

The southern hemisphere of Mars in 1954 showing changes occurring from its late winter to the end of its spring.

A. L.S. 164°. Late winter.
B. L.S. 182°. Early spring.
C. L.S. 203°. Early mid-spring.
D. L.S. 226°. Mid-spring.
E. L.S. 270°. End of spring.

All drawings made with an 8" refl. at 325X (480X also employed on drawing E). Average CM of drawings - 325°.
D. P. Avigliano.

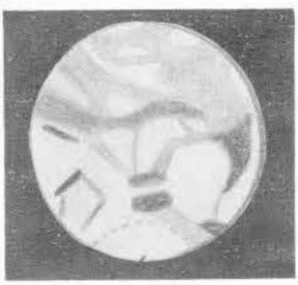


Figure 2. Mars.

Robert Gomien.
July 31, 1954. 2^h 45^m,U.T.
12½" refl. 330X.
C.M. 257°

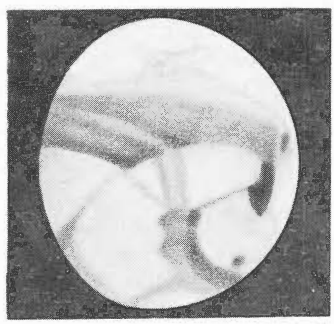


Figure 3. Mars

Tsuneo Saheki.
April 30, 1954. 19^h 15^m,U.T.
8" refl. 285X, 400X, 500X.
C.M. 249° D. 13".3.

Figure 4. Mars.

T. A. Cragg.
Aug. 1, 1954. 5^h 35^m,U.T.
6" refl. 208X.
C.M. 290°. D. 19".3.

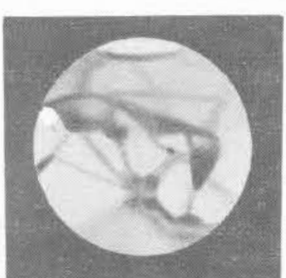


Figure 5. Mars.

D. P. Avigliano.
June 28, 1954. 7^h 15^m,U.T.
8" refl. 325X, 480X.
C.M. 259°. D. 21".8.

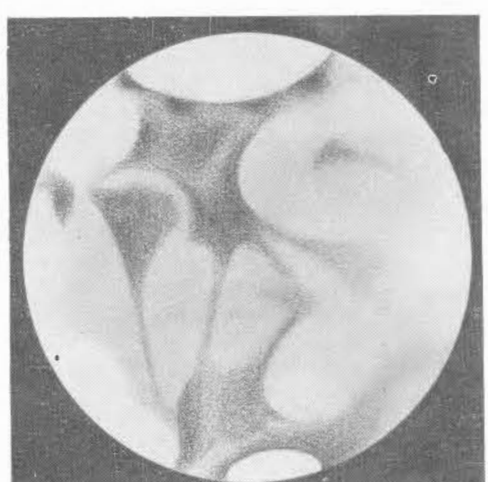


Figure 6. Mars.

R. M. Baum.
July 6, 1954.
22^h 45^m, U.T.
4½" refr. 186X.
C.M. 55°.

1954 by the A.L.P.O. observers. The number following the name of the canal is the approximate longitude at which the canal may be found on the A.L.P.O. map of Mars, for 1954.

Bidis (180°). Short canal, rather difficult but definite when seen.
Tartarus (185°). Usually seen as somewhat diffuse and faint.
Hades (185°). Wide and easily seen.
Avernus (190°). Somewhat diffuse and faint, rather difficult.
Saus (190°). Longer canal, somewhat diffuse and faint, rather difficult.
Scamander (200°). A wider dark region canal dividing the areas of Electris and Eridania.
Laestrygon (200°). Usually seen as somewhat diffuse.
Dis (200°). Very wide, diffuse and faint.
Styx (205°). Wide and somewhat curved canal, prominent.
Gaesus (210°). Fairly narrow dark region canal, prominent when well seen (Fig. 7).
Cerberus I (210°). Very dark and very prominent wedge-like canal running from the Trivium Charontis.
Cerberus II (225°). Fairly narrow canal running from the Cerberus I to the S. Maria.
Antaeus (210°). Usually seen as somewhat diffuse.
Chaos (215°). Quite narrow.
Gyndes (215°). Somewhat diffuse and faint.
Cyclops (220°). Narrow, faint and difficult.
Eunostos I (225°). Narrow.
Eunostos II (240°). Narrow and faint.
Xanthus (235°). Broad band dividing the areas of Eridania and Ausonia.
Hyblaeus (230°). Narrow.
Nar (235°). Narrow, faint and difficult.
Poras (235°). Short dark region canal dividing Hesperia. Faint and difficult.
Adamas (240°). Fairly narrow.
Aethiops (245°). Fairly narrow.
Mosa (250°). Short canal crossing the mouth of Hesperia. Faint and difficult.
Amenthes (250°). Fairly narrow.
Alcyonius (250°). A fairly prominent, wider canal.
Heliconius (255°). Fairly wide, somewhat difficult canal.
Pallas (265°). Fairly narrow, faint canal; difficult.
Casius (270°). A prominent wider canal.
Thoth-Nepenthes (270°). Very wide and extremely prominent during most of the apparition.
Melos (270°). A short, narrow canal, faint and difficult.
Rhesus (285°). A short narrow canal, faint and difficult.
Nilosyrtis (285°). Fairly narrow.
Peneus (290°). A canal crossing the region of Hellas, very faint and extremely difficult.
Alpheus (290°). A canal crossing the region of Hellas, very faint and extremely difficult.
Astusapes (300°). Fairly narrow, difficult.
Dosaron (305°). A fairly prominent dark region canal.
Astaboras I (305°). Fairly narrow.
Astaboras II (320°). Narrow and slightly more difficult than the Astaboras I.
Vexillum (305°). Fairly narrow.
Ceos (320°). Very short, narrow and difficult.
Poros (320°). Short, narrow and difficult.
Typhon (320°). Narrow.
Phison (320°). Seen as a broad band at times and as a pair of very narrow canals at other times. Occasionally only one of the narrow components of the double canal was seen.
Sitacus (320°). Narrow.
Protonilus (320°). A prominent, fairly narrow canal.
Pierius (320°). A somewhat diffuse, fainter canal.
Euphrates (335°). Same description as the Phison.
Arnon (335°). Wide, diffuse and faint.
Labotas (345°). Narrow.
Orontes (345°). Narrow.

Hiddekel (345°). Only one component of this, quite often, double canal was well verified, narrow.
Djihoun (355°). Narrow.
Deuteronilus (355°). Prominent, fairly narrow.
Callirrhoe (0°). Faint and difficult.
Gehon (5°). Same description as the Phison.
Cantabras (10°). Narrow, faint and very difficult.
Aurum (15°). A dark region canal, difficult.
Oxus (15°). Narrow.
Indus (20°). Fairly narrow.
Nixis (30°). A dark region canal crossing the Mare Acidalium, difficult.
Garrhuenus (30°). A dark region canal, difficult.
Dargamanes (40°). A long dark region canal.
Aurorae (40°). Narrow, faint and very difficult.
Hydraotes (40°). Faint, narrow and difficult.
Jamuna (45°). Faint and very difficult.
Nilokeras I (55°). A prominent, wide and somewhat wedge shaped canal.
Nilokeras II (50°). Narrow.
Phryxus (50°). Narrow and somewhat difficult.
Dodon (60°). Narrow.
Lysis (65°). A short wider canal.
Ganges (65°). Same description as the Phison.
Baetis (65°). A short, somewhat difficult canal connecting to the Juventae Fons.
Chrysas (70°). A short, very difficult canal connecting to the Juventae Fons.
Agathodaemon (70°). Narrow and very prominent.
Helorus (80°). Narrow, faint and difficult. Connecting to the Solis Lacus.
Nectar (75°). Narrow and fairly prominent. Connecting to the Solis Lacus.
Corax (80°). Narrow and fairly prominent. Connecting to the Solis Lacus.
Chrysorrhoas (80°). Narrow.
Issedon (80°). Wider and diffuse, difficult.
Uranius (85°). Wider and diffuse.
Nilus (85°). Faint.
Chalus (85°). Faint, narrow and difficult. Connecting to the Solis Lacus.
Puls (85°). A very short and extremely difficult canal <u>within</u> the Solis Lacus.
Por (85°). Same description as Puls.
Ra (95°). Same description as Puls.
Tithonius (95°). A very prominent, wide band.
Eosphoros (100°). Narrow.
Acampsis (105°). Faint, narrow and difficult.
Bathys (100°). Faint and narrow.
Ambrosia (90°). A prominent wide band.
Coprates (85°). Narrow and faint.
Kedron (80°). Short, narrow and faint.
Fortunae (100°). Fairly narrow, faint and difficult.
Draco (90°). Fairly narrow, faint and difficult.
Ceraunius (100°). Fairly prominent.
Daemon (105°). A narrow, short canal.
Iris (105°). Fairly narrow, faint and difficult.
Ulysses (110°). A wider, faint canal.
Phasis (115°). A wider, faint canal.
Iunonius (115°). Faint and difficult.
Araxes (120°). Fairly narrow and faint.
Parcae (125°). Very faint and extremely difficult.
Acheron (120°). Faint and difficult.
Euminides (125°). Fairly prominent, wide and diffuse.
Phlegethon (125°). A wider, diffuse band.
Sirenius (130°). Fairly narrow, faint and difficult.
Gigas (135°). Faint, wider and diffuse.
Elison (135°). Fairly narrow, faint and difficult.
Pyriphlegethon (130°). A wider, diffuse band, difficult.
Medusa (140°). Fairly narrow, faint and difficult.
Gorgon (150°). Fairly narrow, faint and difficult.
Thermodon (145°). A dark region canal. Wider, faint and diffuse.

Athos (155°). A short narrow canal, rather difficult.
Simois (165°). A wider dark region canal dividing the regions of Phaethontis and Electris.
Brontes (165°). A fairly narrow canal, faint.
Eleus (170°). A short, narrow canal, rather difficult.
Fevos (170°). A short, narrow canal, rather difficult.
Midas (165°). A short, narrow canal, rather difficult.
Orcus (170°). A longer canal, wider and diffuse.
Erebus (175°). A wider, somewhat faint canal.
Titan (175°). A medium narrow canal, faint.

Thus we have no less than 122 independently confirmed canals or canal-like features seen by our observers in 1954.

It will be noted that, on occasion, 4 of these canals appeared as double (the Phison, Euphrates, Gehon and Ganges). These double appearances were independently confirmed (some of them having been seen as double on the same night by different observers). There were 12 canals reported as double by single observers (unconfirmed), some of them seen on more than one occasion by the same observer. These were the Thoth-Nepenthes, Adamas, Styx, Orcus, Uranius, Gigas, Laestrygon, Araxes, Astaboras I, Hiddekel, Djihoun and Nilosyrtis. Of these the Thoth-Nepenthes and Hiddekel were probably noted the most often. The dates on which the double appearances were seen varied from April to August, 1954.

To certain of the observers (Ebisawa, Saheki and Avigliano) some of the canals took on a mottled appearance. There was no confirmation however and the evidence for this is very inconclusive. Ebisawa, who probably had some of the finest seeing of the apparition, reports the canals as changing in appearance as the seeing conditions varied. In good seeing (about 7 on a scale of 10) many of the canals were seen as fine doubles (Lowellian), in seeing of about 5 they were seen as broad bands, while in the best seeing (as good as 9) he reports them as being resolved into chains of the finest details. Ebisawa used an 8" refractor in these observations.

<u>Oases</u>. The following is a complete list of all the confirmed oases seen in 1954 by our observers.

Propontis I (180°).
Propontis II (180°).
Hypelaeus Fons (180°).
Aernos Lacus (190°).
Stygus Lacus (200°).
Hecates Lacus (210°).
Pambotis Lacus (215°).
Morpheos Lacus (225°).
Hephaestus Lacus (235°).
Sithonius Lacus (235°).
Zea Lacus (290°).
Iseum Fons (275°).
Nili Lacus (290°).
Antigones Fons (300°).
Astaborae Fons (310°).
Coloe Palus (305°).
Ismenius Lacus (335°). A double oasis composed of Lysa Fons and Elusa Fons.
Juturna Fons (335°). A double oasis composed of Juturna Lacus and Euphrates Lacus.
Sirbonis Palus (335°). A double oasis composed of Sirbonis Lacus and Semiramidis Lacus.
Arethusa Lacus (335°).
Olympia Fons (0°).
Aes Fons (355°).
Lex Fons (5°).
Siloe Fons (10°).
Dirce Fons (5°).
Oxia Palus (20°). A caret-like oasis.

Miliacus Lacus (30°). A double oasis composed of Endor Fons and Engedii Fons.
Protei Lacus (45°).
Clytaemnestrae Lacus (45°).
Craneum Fons (50°).
Acidalius Fons (65°).
Lunae Lacus (70°).
Juventae Fons (70°).
Oleaster Lacus (60°).
Maeisia Silva (80°). Composed of Ceti Lacus and Melas Lacus.
Messeis Fons (85°). Composed of Hebes Lacus and Echus Lacus.
Tithonius Lacus (100°).
Ascraeus Lacus (100°).
Mareotis Lacus (100°).
Gallinaria Silva (110°).
Bathys Portus (110°).
Phoenicis Lacus (110°).
Sirii Fons (115°).
Arsia Silva (120°).
Biblis Fons (130°).
Hercynia Silva (130°).
Borbeis Fons (130°).
Nodus Gordii (145°).
Nesis Fons (140°).
Albis Lacus (140°).
Medusae Fons (170°).
Maricae Lacus (165°).
Euxinus Lacus (160°).
Castorius Lacus (155°).
Ammonii Fons (175°).
Trivium Charontis (195°). Large triangular area. Extremely dark and prominent.
Fulgoris Fons (90°). Oasis within the Solis Lacus.
Helii Fons (85°). Oasis within the Solis Lacus.
Vestae Fons (85°). Oasis within the Solis Lacus.
Peri Fons (95°). Oasis within the Solis Lacus.
Phoebi Fons (90°). Oasis within the Solis Lacus.

Thus there were 61 oases seen, not including the oases that were double in appearance; including these, there were 67. The appearances of these features varied from large diffuse spots to tiny blackish points.

Carets. Some of the so-called carets (small triangular points on the N. edges of the S. Maria, usually at the origin of canals that extend into the desert regions) were well seen. The most notable of these were the Laestrygonum Sinus (200°), Tritonis Sinus (245°), Typhonii Sinus (315°), Oxia Palus (20°) - (see under Oases), Sirenum Sinus (130°), Gorgonum Sinus (150°), Gigantum Sinus (160°), Titanum Sinus (170°) and the double caret at the Sigeus Portus, each of these latter carets leading into the components of the doubled Phison and Euphrates canals.

Seasonal Changes. In July three observers (Tombaugh, Capen and Avigliano) obtained drawings of a seasonal extension of the Ganges canal (Fig. 8). Tombaugh comments on this appearance as follows:

" In July, ... the Ganges shadings became darker and more extended. The Ganges extension moved westward (Martian direction) until it touched Fons Juventae. These darkenings faded in August until the regions were practically normal in September."

The following are Capen's comments on the same appearance:

"(June 11); The Juventae Fons was clearly and sharply defined, particularly in red light. The Chrysas, Ganges, and Baetis canals were fairly easy to see extending into the desert. The Sapis canal was faintly seen extending into the Ophir Desert. A white area was noted on the immediate following side of the canal Chrysas, and extending to the Sapis Canal.

"(July 26); Only the Baetis Canal and Ganges Canal were noted. The Ganges was swollen clear out to the Baetis Canal and Juventae Fons, then tapered

back to the Lunae Lacus. No white area was noted."
A seasonal quickening (darkening) of the canals was noted by several observers, especially from late June to early August. The drawings by Saheki show this seasonal change quite well (Figs. 9 and 10). Note the double appearances of the Thoth-Nepenthes and Euphrates canals along with the darkening and improved definition of details on Fig. 10, even though the seeing was not quite so good as at the earlier date (Fig. 9).

Unusual Observations. Of the better views of certain of the Martian areas one by Saheki showing the N.W. part of Thaumasia merits our special attention. Note the wealth of unusual detail shown (Fig. 11).

One of the most interesting and possibly most enlightening of the observations received of the canals was one by Thomas R. Cave, Jr. This was the only 1954 observation received that was made with a very large telescope (Fig. 12). Mr. Cave's comments are most interesting:

"It was my very good fortune on July 5-6, 1954, very near the date of the 1954 opposition of Mars, to observe the planet for over an hour with the 40" Yerkes Observatory Refractor, the world's largest refracting telescope. Seeing was only fair, although the 40" refractor revealed an amazing amount of detail on Saturn and in its ring system. A magnification of 320X was used with a yellow filter. When Mars was brought into the field of the great telescope and I was permitted to make the drawing seeing conditions were fluctuating from fractional seconds of a very steady image to at times several seconds of very unsteady seeing. I was immediately struck with the extreme contrast of details on Mars, probably intensified by the use of the yellow filter, and the enormous amount of details of very minute nature which could be glimpsed by flashes and in fact were seen too fleetingly to be recorded on the drawing with certainty. Minute details in the Maria and very faint half tones in the northern deserts of Mars were seen with great ease compared with such details usually seen with great difficulty in much smaller instruments. The entire general appearance of Mars with this instrument was vastly different than when observed with much smaller instruments. The most striking thing about the whole observation was the minuteness of the oases and the thinness and regularity of the Canals. I had rather expected not to see any Canals with the 40" due to the seeing conditions of the evening. The Canals were not at all easy objects but when flashes of seeing did occur for a fraction of a second, and the view was extremely fine the canals were most certainly there .... Although I was observing 'The Hard Side' of Mars, ... the planet did not appear at all as others in the past have so often described it in very large telescopes, particularly Antoniadi when he observed it so often with the 33" Meudon Refractor .... My views of Mars at Yerkes most certainly do not confirm his findings."

Concluding Statements. Other comments regarding the canals that should be of interest to our readers are those of Mr. Walter H. Haas and Mr. Clyde W. Tombaugh. Mr. Haas remarks:

"Some of the canals look very narrow to me and indeed almost Lowellian except that they are not extremely dark. Other canals appear to possess very appreciable breadths. Perhaps this latter condition holds especially between longitudes 70° and 180°."

Mr. Haas was using a 12½-inch reflector in his 1954 observations. His statements may be taken as the general impression of the canals as seen by most of our observers. Mr. Tombaugh comments on the appearance of the canals as he has seen them over the many years that he has been observing Mars:

"As for canals, I have seen about a hundred different ones thru the years. They also present an interesting story on developments and changes in appearance as a function of seasons. I have seen some of them much as Lowell and Slipher have seen them--very fine and straight, other canals as soft, ill-defined, some appreciably curved and irregular, arcs of small circles; some connecting salient features at each end, others stopping in the middle of nowhere. Some develop into strips of appreciable width and some double canals 'fill-in' during the spring and summer seasons. At such times when canals and semi-maria are undergoing dark expansions, certain desert areas in the same latitudes are white in early Martian mornings and late afternoons. On April 8, 1950, G.C.T., at McDonald Observatory I got several brief glimpses of the canals seeming to resolve into detail in the region between the Phison and Gehon (C.M. 320°)."

In this last mentioned observation Mr. Tombaugh was using the 82" McDonald reflector stopped down to 30" aperture with an eccentric diaphragm. The power used was 660X. Seeing conditions were varying from 7 to 9, on a scale of 0 (worst) to 10 (perfect).

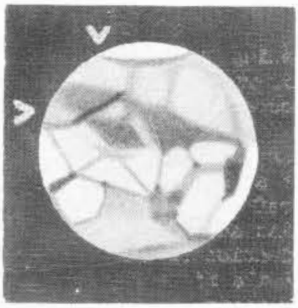


Figure 7. Mars

D. P. Avigliano
June 29, 1954. $7^h\ 00^m$, U.T.
8" refl. 325X.
25 Red filter employed.
C.M. -246°. D- 21"8.
Note the prominent appearance of the dark region canal, Gaesus.

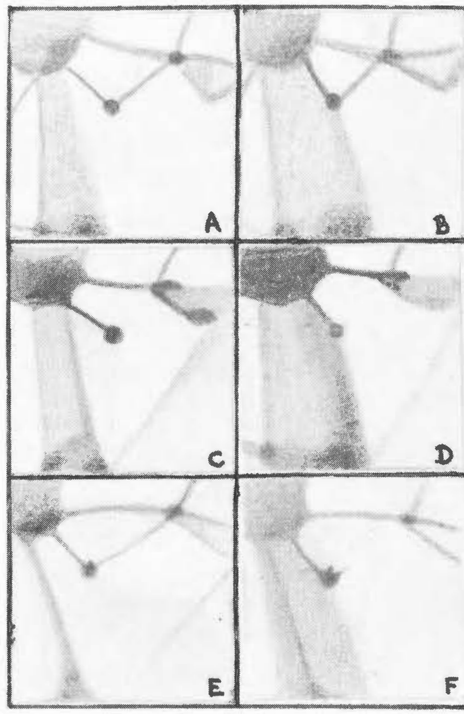


Figure 8.
The region of the Ganges canal showing seasonal changes.
A. June 11, 1954. 24" refr.
B. July 18, 1954. 8" off axis refl.
Taken from the drawings of Clyde W. Tombaugh.

C. June 11, 1954. 8" refl. 325X, 480X.
D. July 18, 1954. 8" refl. 325X, 480X.
Drawings by D. P. Avigliano.

E. June 11, 1954. 24" refr. 290X, 540X.
F. July 26, 1954. 7" refr. 292X.
Drawings by C. F. Capen, Jr.

See text for details.

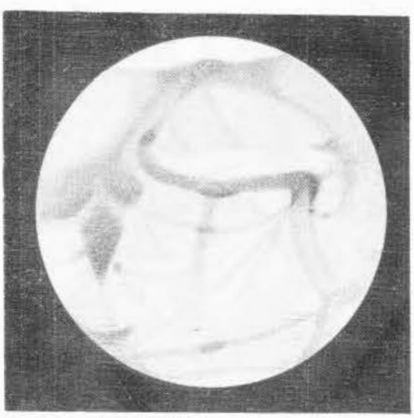


Figure 9. Mars.

Tsuneo Saheki.
July 3, 1954. $14^h\ 45^m$, U.T.
8" refl. 285X, 400X.
C.M. - 324°. D.- 21"8.

See text for details.

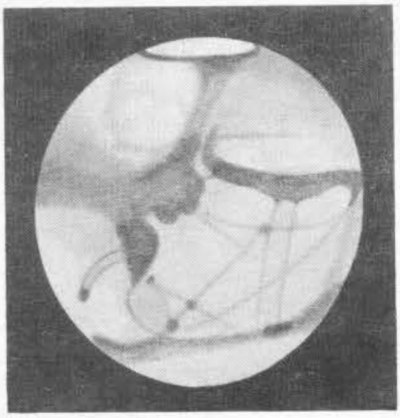


Figure 10. Mars.

Tsuneo Saheki.
Aug. 8, 1954. $11^h 30^m$, U.T.
8" refl. 330X, 400X.
C.M. 312°. D.-18".2.

See text for details.

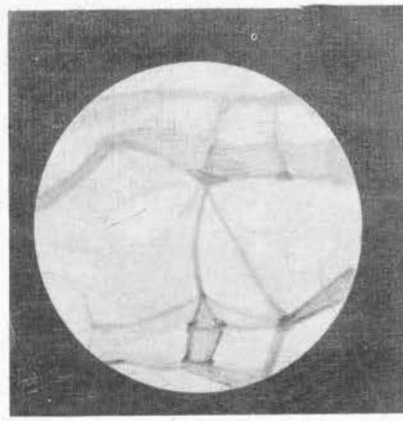


Figure 12. Mars.

T. R. Cave, Jr.
July 6, 1954. 4^h U.T.
40" refr. 320X.
C.M. 140°. D. 21".8.

See text for details.

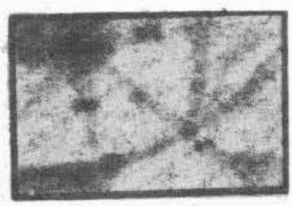


Figure 11. Mars.

Detailed observation of the N.W. part of Thaumasia.
Tsuneo Saheki.
July 23, 1954. $12^h 00^m$, U.T.
8" refl. 330X, 400X, 500X.

Postscript by Editor. We express our deep thanks to Mr. Avigliano for these two final articles on the 1954 apparition of Mars, which have certainly been worth waiting for, and for the remarkably fine job which he did as Mars Recorder in 1954. The map of Mars in 1954 drawn by Mr. Avigliano from A.L.P.O. records has received some recognition from professional astronomers and is certainly one of the best pieces of work yet accomplished by the A.L.P.O.

TOTAL SOLAR ECLIPSE OF 1958 OCTOBER 12.

by Frank M. Bateson

The Total Solar Eclipse next year will afford members of the A.L.P.O. the opportunity of a unique experience if it is possible for them to organize an expedition to the Pacific.

The only land from which the total phase is visible are eight small atolls of the storied Polynesian islands. These range from Atafu at West Longitude 172° 30' and latitude South 8° 33' to Mopelia at West 153° 55', South 16° 48'. Three of the islands lie within the Tokelaus, or Union Group; three in the Northern Cooks and two in the Society islands. It is generally considered that these atolls are lonely places, hard to get to. Actually all can be reached with ease from the Pacific Coast. The easiset to get to are the two islands of the Society Group, known as Scilly and Mopelia. These lie within the area of French Oceania and are reached through fabled Tahiti. Both islands form part of the same group as Bora Bora, so well known to Americans during the Second World War.

Tahiti is served by surface connections, both from the Atlantic and Gulf ports as well as from the Pacific Coast. These vessels permit the shipment of all equipment direct to Tahiti and of course, personnel can also secure accommodation on these vessels if they book well in advance. Should they prefer to travel by air, they will have to pass from Hawaii to Fiji and then transfer to the Coral Route to Tahiti. The port of entry for Tahiti is Papeete, famed throughout the world as being something different. There are no regular local ships trading from Papeete to Mopelia and Scilly, but it is possible to engage an American Auxiliary Schooner to transport both equipment and personnel to the Eclipse islands and to return them to Tahiti when the eclipse is over. The cost per head is dependent on the number making the trip; but if a reasonable number travel, the charges will be approximately 250 dollars per head or even less.

For the Northern Cooks the main port of entry is Rarotonga, to which freighters of the Union S.S. Co. call at irregular intervals from the Pacific Coast. These vessels take a limited number of passengers as well as freight. Whilst for the Tokelaus the port of entry is either direct from Apia, Western Samoa, or from Fiji and thence by air or sea to Apia.

From Rarotonga to the Northern Cook islands of Pukapuka (Danger Island); Nassau and Suwarrow, it will be possible to travel by inter-island motor vessel or auxiliary schooner. One such vessel at least is prepared to run a special trip to the islands concerned two or three weeks before the Eclipse and to return afterwards for personnel and equipment. For the latter only normal freight rates of approximately 24 dollars per ton will be charged both ways. Fares will be dependent on the route taken, i.e. number of islands called at first, but for the round trip will be about 123 dollars per head. In addition, it is possible that the return call will mean a special trip and in that event an extra overall amount of 984 dollars will be charged for the service. But this fee would cover any number of passengers.

Costs from Apia to the Tokelaus are much dearer and these islands are harder to reach due to an inadequate and infrequent service. The small British Expedition will probably be stationed at Atafu in this Group. In the Northern Cooks there are likely to be several expeditions; but as far as is known, nothing has so far been planned for the French islands.

It seems that the best available weather prediction gives a sixty percent chance of clear skies with the likelihood that the best chance is in the French islands. Here the Sun will be at an altitude of 62 and 63 degrees compared to 37 in the Tokelaus and 45 to 50 degrees in the Northern Cooks. The local time of totality varies from 8.07 a.m. to just after 10 a.m.

The Tokelaus and the Cook Groups are dependencies of New Zealand; Scilly and Mopelia are part of French Oceania. Any expedition would have to secure the necessary permission from the administrating Governments. Such expeditions would have to be self contained in every way.

The writer will be visiting the States from late September to December this year. Any A.L.P.O. members can secure information and advice as to conditions in the islands concerned from him then. His address will be: care of the Flower and Cook Observatories, University of Pennsylvania, Philadelphia, Penna. However, it is again stressed that after securing such advice any intending expeditions would have to make official application through American authorities to the I.G.Y. Committee in Wellington (N.Z.) for permission to proceed to either the Tokelaus or the Cooks. For the Society islands the same application would have to be made to the Governor at Tahiti.

Postscript by Editor. We thank Mr. Bateson very much for this advance information on a total solar eclipse, and we are sure that as many of our members as possible will want to meet him during his coming visit to the United States.

It will indeed be excellent if the A.L.P.O. can organize an expedition to observe this eclipse. We have, unfortunately, no funds equal to underwriting such an expedition, or even to paying the travelling expenses of one member of it. Nor can many amateurs leave their jobs for the several weeks or even months which a properly handled eclipse expedition would surely demand. Even so, we would be most delighted if some of our members can make plans to observe this eclipse; and we should like very much to hear from them.

JUPITER IN 1956-57: FIRST INTERIM REPORT

by Henry P. Squyres

Foreword. This article is the first Report on Jupiter for the 1956-57 apparition. Generally speaking, the Giant Planet showed a large amount of activity as regards the belts. The Red Spot also showed very much activity in this apparition. Figures 14 through 20 show some typical views of the planet as seen by some of our observers. Figure 13 shows the standard nomenclature of the belts and zones and will be helpful in following this discussion.

The following list covers all the people who contributed drawings, notes and color estimates up to May 18, 1957. Any drawings received after this date will be listed in the next Report. So far, a total of 26 observers have contributed a total of 123 drawings.

Contributing Observers

Observer	Telescope	Number of Drawings	Location
Ray Burg	4" refr.	1	Dyer, Indiana
Steve Almen	6" refl.	2	Topeka, Kansas
S. Bieda	8" refl.	1	San Jose, Calif.
Phillip W. Budine	3" refr.	3	Binghamton, New York
T. R. Cave, Jr.	12½" refl.	2	Long Beach, Calif.
D. Delgrande	8" refl.	1	San Jose, Calif.
Jack Eastman	6" refl.	4	Manhattan Beach, Calif.
Edwin Gilmore	4" refr.	1	Allentown, Penna.
Walter H. Haas	12½" refl.	written report	Las Cruces, New Mexico.
Alika K. Herring	12½" refl.	7	South Gate, Calif.
Mike Kaiser	6" refl.	3	Keokuk, Iowa.
Franklin Loehde	12½" refl.	6	Edmonton, Alberta, Canada.
Don MacPherson	12½" refl.	1	Edmonton, Alberta, Canada.
Johnny Mandrusiak	12½" refl.	1	Edmonton, Alberta, Canada.
Charles Martens	6" refl.	3	Charles City, Iowa.
Joe S. Miller	6" refl.	18	Beverly Hills, Calif.
Toshihiko Osawa	6" refl.	15	Osaka, Japan.
Owen C. Ranck	4" refr.	13	Milton, Penna.
E. J. Reese	6" refl.	1	Uniontown, Penna.
L. J. Robinson	10" refl.	9	Sylmor, Calif.
H. T. Sherman	8" refl.	3	St. Paul, Minn.
C. J. Smith	9.5" refr.	4	Oakland, Calif.
H. P. Squyres	6" & 12½" refls.	10	El Monte, Calif.
James E. Starbird	6" refl.	5	Topeka, Kansas.
Frank J. Suler	8" refl.	6	Holloman A.F.B., New Mexico.
Tom Waineo	8" refl.	3	Detroit, Mich.

Red Spot Area. This was the most active area on Jupiter during April and May, 1957. The Red Spot was observed to be a salmon pink in color during December, January and February. In early March it became darker and developed a very dark red border. By April the Red Spot had become a very dark blood red. Many observers have reported that the Red Spot is as dark as they have ever seen it. Figures 14, 15, 16, 17, and 25 show some of the changes in the Red Spot during this apparition. In Figure 15 the South Tropical Belt (in the normally beltless South Tropical Zone between the South Temperate Belt and the South Equatorial Belt South) is seen to go over the Red Spot. In Figures 16 and 25 white clouds were observed in the interior of the Spot. It is interesting to note that the South Tropical Belt bends north and combines with the S.E.B. just north of the Red Spot (see Figure 16). This aspect was noted by several observers. A tilting of the major axis of the Red Spot to the plane of Jupiter's equator by about 13° in a south preceding-north following direction was noted by several of the observers.

South Tropical Belt Disturbance. A new Disturbance developed between January and February just north of the S. Temp. B. at longitude (II) 90°. This Disturbance was first reported by Thomas A. Cragg in early February. The new Disturbance is

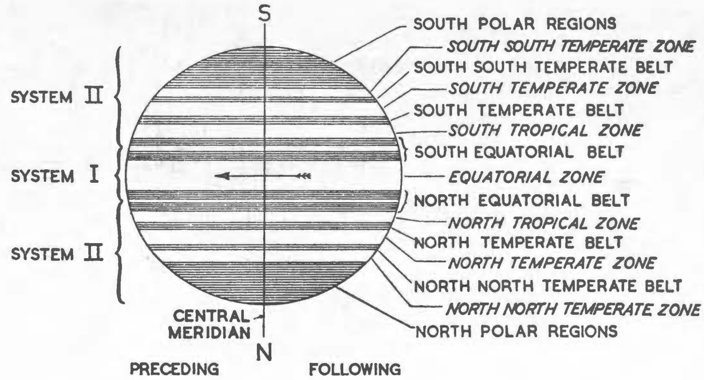


Figure 13
Standard Nomenclature of the Belts and Zones of Jupiter. From "The British Astronomical Association, Its Nature, Aims, and Methods"

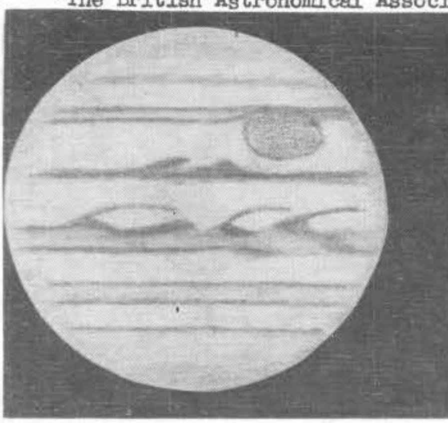


Figure 14. Jupiter
Chester J. Smith. 9.5" Refr. 225X.
S: 4 T: 4.5. Dec. 8, 1956.
14^h 50^m, U.T.
C.M. I = 172°
C.M. II = 280°

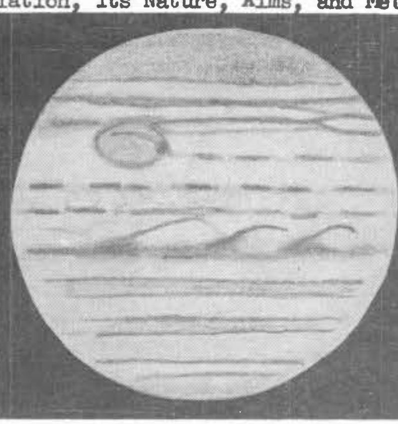


Figure 15. Jupiter
Alika K. Herring. 12.5" Refl. 228X.
S: 4-5 T: 2. March 16, 1957.
6^h 50^m U.T.
C.M. I = 241°
C.M. II = 324°

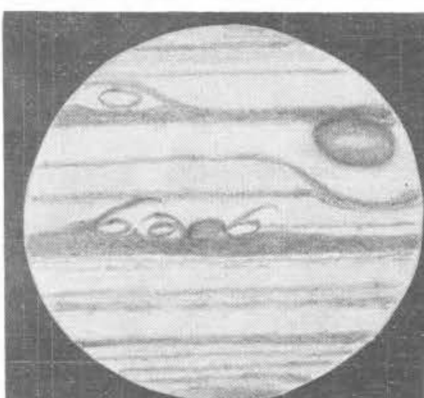


Figure 16. Jupiter
Henry P. Squyres. 12.5" Refl. 300X.
S: 6-7. T: 2. April 13, 1957.
8^h 20^m U.T.
C.M. I = 40°
C.M. II = 269°

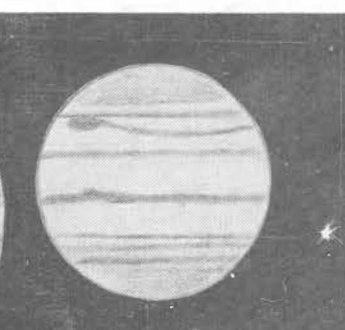


Figure 17. Jupiter
Jack Eastman. 6" Refl.
180X. S: 5. T: 4.
March 24, 1957. 4^h 35^m, U.T.
C.M. I = 343°
C.M. II = 5°.

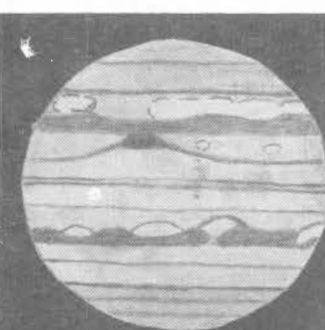


Figure 18. Jupiter
Joe S. Miller. 6" Refl.
175X. S: 1-2.5. T: 2.
April 3, 1957. 5^h 15^m, U.T.
C.M. I = 148°
C.M. II = 93°

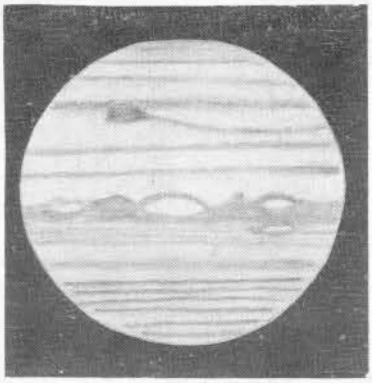


Figure 19. Jupiter
Henry P. Squyres. 12.5" Refl.
225X. S: 4-5. T: 3
April 5, 1957. 7^h 00^m, U.T.
C.M. I = 168°.
C.M.II = 98°.

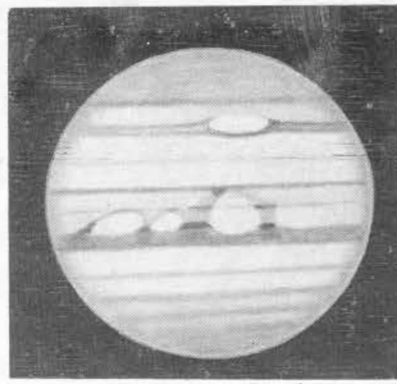


Figure 20. Jupiter
E. J. Reese. 6" Refl. 350X.
S: 4-5. T:3-4.
Nov. 4, 1956. 11^h 25^m, U.T.
C.M. I = 80°.
C.M.II = 89°.

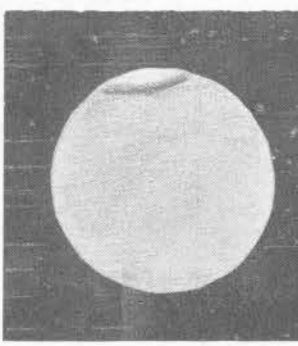


Figure 21. Ganymede
H. P. Squyres. 12.5" Refl.
675X. S: 7. T: 3.
April 14, 1957.
8^h 20^m, U.T.

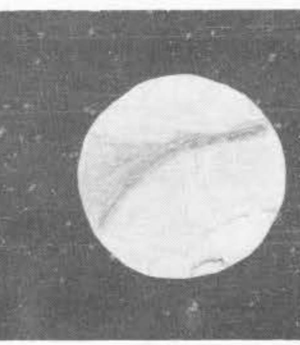


Figure 22. Ganymede
Joe S. Miller. 6" Refl.
400X. S: 6-7. T: 2-4.
April 9, 1957.
6^h 25^m, U.T.

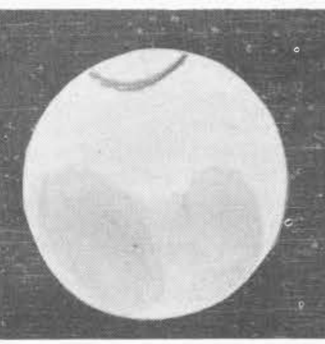


Figure 23. Ganymede
T. R. Cave,Jr.
12½" Refl. 700-1000X.
S: 8-9. T: 5
April 19, 1957.
6^h 50^m, U.T.

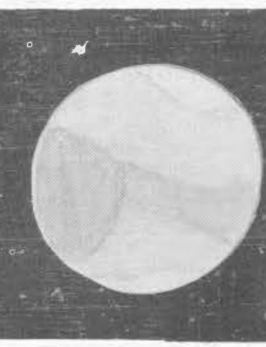


Figure 24.Ganymede
T.R. Cave,Jr.
12½" Refl.
700-1000X.
S: 8-9. T: 2.
April 25, 1957.
7^h 20^m, U.T.

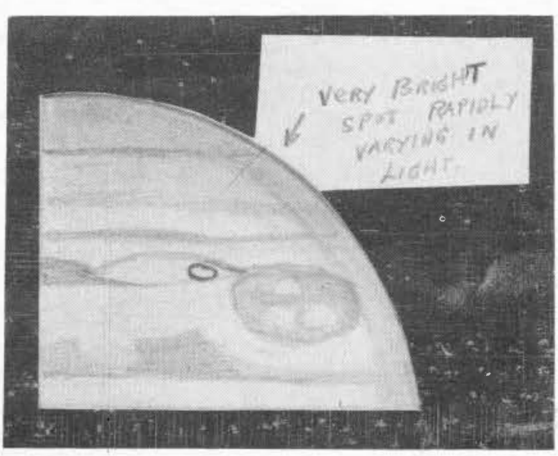


Figure 25. Jupiter
T. R. Cave, Jr. 12½" Refl.
224-300X. S: 5-7. T: 4.
February 22, 1957.
7^h - 7^h 15^m, U.T.
C.M. II = 265°.

about 10° long. Some observers mistook this feature for the Red Spot. Figures 18 and 19 show this Disturbance.

Belts. The N.E.B. remained the most prominent belt, with the S. Temp. B. following. In the order of their decreasing conspicuousness the belts usually recorded were: N.E.B., S. Temp. B., S.S.S. Temp. B., N.N. Temp. B., S.E.B. s, S.E.B. n, N.N.N. Temp. B., S.S. Temp. B., N. Temp. B., E.B., and the N. Trop. Z. Band.

The N.E.B. was very active as far as festoons go. In nearly all the drawings received the N.E.B. had several festoons on its south side. (See Figures 14, 15, 16, 18, 19, and 20). On February 4 Mr. Miller saw a very large festoon on the south side of the N.E.B. near longitude (I) 240°. This festoon was observed to be a long, straight, dark line which extended up to the Red Spot in a southwest direction. There were many other large festoons on the N.E.B. reported by other A.L.P.O. observers. Figure 20 shows a large festoon extending up to the S.E.B. near the central meridian.

The E.B. (Equatorial Band) was observed on several occasions by Suler, Robinson, Cave, Herring, C.J. Smith, Miller, Budine, and Squyres. During the last part of December,1956, Cave, Herring and Miller saw the E.B. triple several times.

The shaded North Polar Region was found to consist entirely of belts by many observers during this apparition. Chester J. Smith has made a list of these belts in their order to the north of the N.E.B. They are: N.T.B.s, N.T.B.n, N.N.T.B.s, N.N.T.B.n, N.N.N.T.B.s, N.N.N.T.B.n, N.P.B.s, N.P.B.n, and the dark polar cap. Most of these belts can be seen in Figures 15, 16, and 19.

Intensity and Color Estimates. The following table gives the intensity and color estimates of two observers. The intensities are based on a scale of 0 (very darkest marks) to 10 (very brightest marks). Color estimates are designated by letters as follows: Br - brown, Bl - blue, Bl - G - bluish gray, G - gray, R - Br - reddish brown, T - tan, W - white, Y - W - yellowish white, and Y - yellow.

Intensities and Colors of Jovian Features, 1956-57

	Budine		Haas	
	I	C	I	C
RS	-	-	3.5	R-br
SSTeZ	5.2	Y	5.5	-
STeZ	5.8	Y-W	5.5	W
STrZ	6.3	W	5.0	W
SEBZ	5.0	T	5.0	W
EZ	6.5	W	6.0	W
NTrZ	6.0	W	5.5	W
NTeZ	5.2	Y	5.0	W
SPR	3	G	4.0	G
NPR	3.5	Bl-G	4.0	G
SSSTB	-	-	3.5	R-br
STB	2	Bl-G	2.5	R-br
SEBs	4	Bl	3.5	G
SEBn	3	Bl	3.5	G
EB	4.5	-	4.0	-
NEB	2	R-br	2.5	R-br
NTB	3	G	3.5	Br
NNTB	-	-	3.0	Br

Ganymede. A total of four drawings of Ganymede, satellite III of Jupiter, was received, Figures 21 to 24. All the observers noted that Ganymede was faintly green in color. In Figures 21 and 23 there is a white area on the south limb, which could be a south polar cap. Mr. T.R. Cave noted that the satellite was not round but instead elliptical, Figures 23 and 24.

An Unusual Observation of a Variable Jovian White Spot. Mr. Thomas R. Cave, Jr. has communicated the following report:

"On February 22, 1957, while finishing a full disc drawing of Jupiter, the writer observed a phenomenon which may be unique in Jovian observation.

"At 7^h 18^m, Universal Time, while observing the area of the Great Red Spot which at the time was coming on to the visible side of Jupiter, I noticed a small very bright spot preceding the Red Spot by several degrees. The south latitude of this object was about the same as the southern edge of the Great Red Spot. Seeing was unusually good and at times was nearly perfect for several seconds; estimated on a scale of 0 (worst) to 10 (perfect), seeing was 6 to 8. The telescope used was my $12\frac{1}{8}$-inch Newtonian reflector with a power of 300X.

"White spots are very common on Jupiter, and at times several are easily visible at once in a moderate-size telescope. This small white spot was first noticed because of its unusual brightness; but within about one minute it had faded considerably, and for about two to three minutes it remained rather faint and difficult even though the seeing continued quite steadily good. The white spot rapidly became quite bright again for two minutes and then faded again. This phenomenon was repeated four times until 7^h 37^m, U.T., when the rapid brightening and fading ceased; and although this area of Jupiter was very carefully observed until 8^h 15^m, the phenomenon was never repeated. The spot remained faded but visible and without apparent changes of brightness."

Figure 25 shows Mr. Cave's abnormal bright spot.

A Plea for More Central Meridian Transits. Mr. Chester J. Smith, our Assistant Jupiter Recorder, makes the following appeal:

"Up to the date of this writing very few central meridian transits of markings of the surface of Jupiter have been submitted either to your Jupiter Recorder or to myself. These central meridian transits are essential in order to construct drift charts and to obtain rotation periods for the various belts and zones. All that is required for this work is a telescope, an accurate watch, and, above all, a good eye. Powers of 200X to 300X are suitable, a safe rule being 25 to 30 per inch of telescope aperture. Lower powers produce better contrasts; and we should remember that Jupiter's surface brightness is low, only one-fourth that of Mars. Whenever any marking such as a white spot, dark oval (these are frequent), or a column of any kind is sighted on the following half of the disc, it should be carefully observed. What is required is to time to the nearest minute when the object is exactly midway between the east and the west limbs of Jupiter. (Use the time at your location, whether it be Standard Time or Daylight Saving Time.) Also give a brief description of the object viewed, stating its latitudinal location with the help of Figure 13. A drawing will help. Your Jupiter Recorder will then compute the longitude in either System I (S. edge N.E.B. to N. edge S.E.B.) or System II (rest of disc).

"Once an object is sighted, it may be seen again two nights later, plus two hours. Every twelfth day the object will be in almost exactly the same place as where originally observed. In order to see the portion of Jupiter opposite the originally viewed place, i.e., different by 180 degrees of longitude, observe on the next night, plus one hour.

"At the present time (early June, 1957) there is a dark gathering of material on the south edge of the S.E.B. preceding the Red Spot; this material may cover the Red Spot and change it to the Red Spot Hollow so that this area should be watched carefully. One should watch for dark markings of any kind on the S.E.B.; they might develop into a South Equatorial Belt Disturbance like the one of February, 1955.

"As regards Figure 13, the rotation of System I is 9^h 50^m or 36.6 degrees per hour. That of System II is 9^h 55^m or 36.3 degrees per hour. The rotation in the higher temperate and polar zones is slightly faster than this last figure.

"When making a drawing, first have the oval disc of Jupiter drawn before observing.

In drawing in the detail, draw first the major detail, which must be completed in at most 10 minutes. Other finer detail can then be put in without altering the major markings. Shade the belts and zones just as they appear in your telescope, also the limb darkening. Send in your observations even though they may be your first ones."

SOME FURTHER NOTES ON THE JOVIAN FESTOON SYSTEM

by James C. Bartlett, Jr.

In the autumn of '51 I published a small paper on the Jovian dark spots,[1] the "sunspots" of Jupiter, in which there were also considered certain striking linear features often associated with them. In July of '52 another paper appeared in which comparison was made between these Jovian lines and their analogues on Saturn.[2] These Jovian canali are technically called "festoons", and may be defined as dark, wisp-like markings which commonly connect two dark belts across an intervening bright zone. As to their nature nothing whatever is known and there is even little that can be imagined, though this writer ventured a guess that they might be the effects of some kind of an electrical phenomenon.

Be that as it may this present paper is the fruit of a ten year study of them, covering the period between June 10, 1947 through April 11, 1957. During this time 371 festoons were recorded in a total of 376 observations of Jupiter, an average of 37.6 observations of the planet per year. That there should be so small a number of observations over a decade will surprise no one who is conversant with weather conditions in Baltimore.

One of the principal findings to emerge from this research is the fact that the festoons form readily recognizable types, of which six have been clearly defined. It is very uncertain, however, that the six types represent six different species. It seems more likely that some at least are mere variations on a theme, and one kind, the columnar, may under certain circumstances be illusionary. As considered in this paper we shall classify them as Types A,B,C,D,E, and F. Unwittingly many observers have recorded many of the types, and to their scattered evidence I shall refer by way of illustration.

Type A - Lines.

In this type we have the festoon as a very narrow, hair-like marking sharply defined. Two beautiful examples may be seen in the drawing by Komoda for February 18, 1955, as given on page 128 of The Strolling Astronomer for November-December, 1955.

Type B - Wisps.

These are probably variants of Type A. Like A, they may occur as straight lines but then will differ by being somewhat more diffuse and less sharply presented. They may also occur as short, inclined lines trailing a darker section behind them. A good example of the first class is to be seen in the sectional drawing by E.J.Reese, p. 61 of The Strolling Astronomer for May-June, 1955. Examples of the second class will be found in the two drawings of Jupiter for March 2, 1955, by J. Russell Smith; p. 59 of The Strolling Astronomer, May-June, 1955.

Type C - Columns.

These are commonly short and thick and may be either very dark or rather grayish and nebulous. They are most often found in the interzone between components of a double belt, though they may also connect two adjacent belts close together. Usually they have their bases in prominent dark spots, though this is not invariably the case. They differ significantly from other types in that they are usually vertical, seldom showing the marked inclinations common to lines and wisps.

An example of vertical columns is to be seen in the drawing of Jupiter for January 31, 1955, by O. C. Ranck, as given on page 33 of The Strolling Astronomer for

March-April, 1955. Vertical columns are also depicted in the sectional drawing by A. P. Lenham for February 28, 1955, p. 61 of The Strolling Astronomer for May-June, 1955. They may also be seen in the sectional composite drawing by Reese for March 24-39-30, 1955, on page 61 of the same number.

Rather commonly the bright zones of Jupiter may be filled with bright ovals. These ovals often appear to be separated by, or perhaps to result from, numerous vertical columns. It may be that in some cases of this nature the column is illusionary.

Type D - Diagonal columns.

These differ from the former only in being inclined. Some examples may be found in the drawing of Jupiter by D. P. Avigliano, for January 15, 1954, as given on page 8 of The Strolling Astronomer for January-February, 1954.

Type E - Arcs.

These are very uncommon. They may be sharply defined, like Type A, or wispy and diffuse like Type B; but they differ from both types in not being straight (or sensibly straight) lines. Instead they form gently curving arcs, as if forming part of a circle. Their termini are both approximately in the same longitude, so that the connecting festoon is as it were billowed out between them. I find no examples in recent A.L.P.O. drawings and I have but 13 examples in my own records of 371 festoons. Certain semi-circular markings which do occur in recent drawings, e.g. the sketch by Leonard B. Abbey, Jr. on page 61 of The Strolling Astronomer for May-June, 1955, are not arcs within the meaning of the definition given above.

Type F - Flexures.

This is the rarest of all, and indeed I find only 1 example in my record of 371 festoons. The flexure is somewhat "S" shaped, and it is probable that arcs and flexures both are simply abnormal variants of Types A and B.

Lines, wisps, and columns are about equally abundant, followed by diagonal columns, arcs, and flexures as the table below will make clear.

Table of Incidence of Types, June 10, 1947 - April 11, 1957

Type A	Type B	Type C	Type D	Type E	Type F
99	94	95	69	13	1

The relation between a festoon and terminal spots is not understood. That the spots in some way give rise to the festoon seems probable, though by no means certain. Thus the majority of the 371 festoons observed by the writer were actually lacking in terminal spots, and seemed merely to connect adjacent belts without any discernible structure at the points of contact. How this is to be interpreted is not clearly understood, because it is not known whether terminal spots are always necessary antecedents of festoons. The table below gives the statistical relations.

Festoons with -.

2 terminal spots	1 terminal spot	no terminal spots
48	117	206

As to location it can only be said that for the period covered by the observations there is a statistical preference for the E.Z., and more for the south hemisphere than for the north hemisphere as shown below:

Festoons by Location

NTB-NEB	NEB-EB	NEB_s- SEB_n	SEB_n - SEB_s	SEB-STB	STB-SSTB	STB-SPZ
1	42	127	95	84	7	15

A peculiarity of the Jovian festoons, and one not easy to explain, is their marked inclination. A large majority show this habit as per the table following:

Orientation of Festoons

N.- S.	N.W. - S.E.	N.E. - S.W.
105	183	83

In interpreting the data above it must be understood that the compass points are those of the simple, inverted telescopic image in the N. hemisphere in which the west limb is at the left and the east limb at the right. No difficulty is met in explaining a N. - S. allignment, and a N.W. - S.E. direction might plausibly be ascribed to atmospheric drift; but it is to be noticed that a N.E. - S.W. orientation is in the direction of rotation. If atmospheric currents play any part in producing the inclination it would seem that the festoons of opposite orientation must lie at different levels.

Unless the festoon is a material body it is difficult to see how atmospheric currents could act to orient it, and elsewhere I have given some reasons why festoons seem more likely to be effects rather than things.[1] Of course, differential rates or rotation between adjacent belts would eventually produce an inclination; but it seems very doubtful if such a cause can be invoked for more than a few cases. For instance it is assumed that the south edge of the NEB and the north edge of the SEB rotate in System I, or at the rate of $36\overset{\circ}{.}58$ per hour for both. But if a festoon connecting them has a difference of 20° (not unusual) longitude between termini, then it is clear that for such a difference to have resulted solely from differential rotation the rate of one belt must differ materially from that of the other.

One might suppose that perhaps it is only the terminal spots and not the belts which have such different rotation rates; but this hardly helps us inasmuch as the rotation of the belts is established by measurements on just such spots. Hence if we are to explain the inclination of festoons by differential rotation, then we seem doomed to give up the device of System I and System II which alone enables us to bring some order into the chaos of Jupiter's ephemeral markings.

But perhaps the case is not so desperate as it appears. Suppose,for instance, that the festoons do not actually connect adjacent belts but lie above them. As seen from our position they would <u>seem</u> to connect them through superimposition. However, they might belong to a level having very different rates of rotation from either System I or System II. Opposed to such a possibility, however, is the stubborn fact that the festoons consistently show an apparent fixed relation to the belts, whereas otherwise we should expect to find a random relation.

But one thing seems clear enough. Festoons may yet force us to revise our ideas of the nature and rates of Jovian rotation.

References

1. Bartlett, J.C.; The Spots of Jupiter in The Strolling Astronomer; October, 1951; p. 7.

2. Bartlett, J.C.; Similarities and Differences Between the Festoon Systems of Saturn and Jupiter in The Strolling Astronomer; July, 1952; p. 97.

JUPITER IN 1955-56

by Robert G. Brookes

This Jovian apparition has been a rewarding one. The amateur observer has been able to contribute, in a small way, to identifying - at least tentatively - some of the sources within Jupiter's atmosphere that give rise to the radio noises being detected by radio astronomers.

Jupiter itself has displayed more activity than it usually does. A major Disturbance in the South Tropical Zone that resembled, in some respects, the historical South Tropical Disturbance was the ranking highlight of the apparition. Activity within the North Tropical Current increased by a marked degree, after having been quiescent for the past several apparitions. This increased activity made it possible for a very accurate rotation period for the North Tropical Current to be secured. The Red Spot area, as usual, was a point of interest to the amateur observer. Generally, this feature was quiet and undisturbed during the apparition, having the aspect of the Hollow with the Spot being faintly detected at times. The long-enduring bright areas of the STeZ continue to exist and apparently they are stabilized with respect to their size. These three areas are prime suspects as sources of the Jovian radio noise. Also, they are reliable markings from which to secure the rotation period for the South Temperate Current.

The four Galilean Satellites were sources to some observers of many minutes of pleasure as they went through their five to six year cycle of mutual occultations. However these phenomena were not so well observed as had been anticipated.

We have received reports from 55 observers who sent in 653 drawings, 1926 central meridian transit observations and several hundred pages of observational notes and personal correspondence. The most rewarding thing of all is the increased number of transits. Three observers, Haas, Meisel and Reese were responsible for securing the bulk of the transits. Budine, Epstein, Komoda, Osawa and Vaughn contributed shorter but valuable lists of transits.

The names of the observers sending reports of their observations to the A.L.P.O. are as follows:

Name	Telescope	Station
Leonard B. Abbey, Jr.	8-in. refl., 30-in. refl.*	Decatur, Ga.
Robert M. Adams	10-in. refl.	Neosho, Mo.
Walter F. Barber, Jr.	6-in. refl.	Atlanta, Ga.
Phillip W. Budine	3.5-in. refl., 3-in. refr.	Binghamton, N.Y.
James Burg	4-in.refl.	Dyer, Ind.
Ray Burg	6-in. refl.	Dyer, Ind.
Richard Butler	6-in. refl.	New Kensington, Pa.
Thomas A. Cragg	6-in refr.**, 12-in. refl.	Inglewood, Calif.
Dale P. Cruikshank	8½-in. refr.	Des Moines, Iowa
Charles Cyrus	10-in. refl.	Baltimore, Md.
Arthur Dalton	12½-in. refl. ***	Edmonton, Alberta
Jack Eastman	6-in.refl.	Manhattan Beach, Calif.
Eugene Epstein	10-in.refl.	Hollywood, Calif.
Don Farnsworth	12½-in. refr. ****	Columbus, Ohio
Michael Golub	5 3/8-in. refl.	Los Angeles, Calif.
Joel W. Goodman	8-in. refl.	Brooklyn, N.Y.
Leonard Gordon	4-in. refl.	Norfolk, Va.
Walter H. Haas	12½-in. & 6-in. refls.	Las Cruces, N.M.
W. K. Hartmann	2.4-in. refr., 8-in refl.	New Kensington, Pa.
Richard Herry	12½-in refl.***	Edmonton, Alberta
Alika K. Herring	8-in. & 12½-in. refls.	South Gate, Calif.
Jerome Kaltenhauser	6-in. refl.	Lindstrom, Minn.
Mike Kaiser	6-in.refl.	Keokuk, Iowa
John Kissel	12½-in. refr. ****	Columbus, Ohio
K. Komoda	21-cm. refl.	Miyazaki-ken, Japan
William E. Kunkel	8-in. refl.	Los Angeles, Calif.
Rudolph M. Lippert	8-in. Cass. refl.	San Diego, Calif.
Charles P. Martens	6-in. refl.	Charles City, Ia.
Richard McLaughlin	6-in. refl.	New Kensington, Pa.
Robert McLaughlin	6-in. refl.	New Kensington, Pa.
Ian McLennan	12½-in. refl. ***	Edmonton, Alberta
David Meisel	8-in. refl.	Fairmont, W. Va.
Richard Miller	6 & 4-in. refls.	Dyer, Ind.
A. C. Montague	8-in. refl.	Oak Park, Ill.
Aurea B. Nicolini	12-in. refl.	São Paulo, Brazil

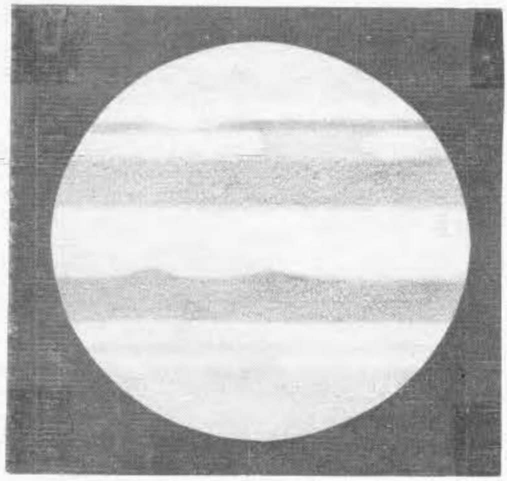


Figure 1. 11-21-55, 20:37 U.T.
CM_1 59°, CM_2 207°,

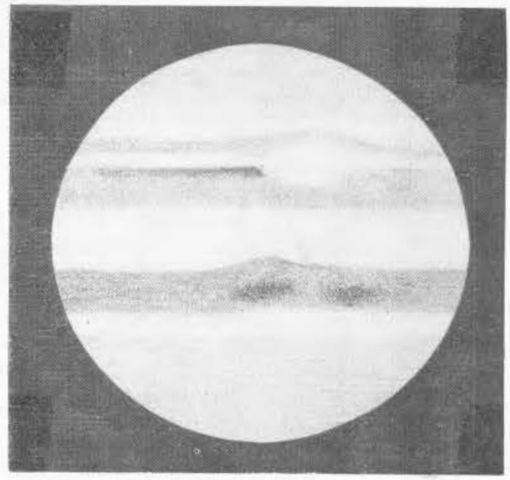


Figure 2. 1-29-56, 14:35 U.T.
CM_1 298°, CM_2 282°, S4-5, 180x

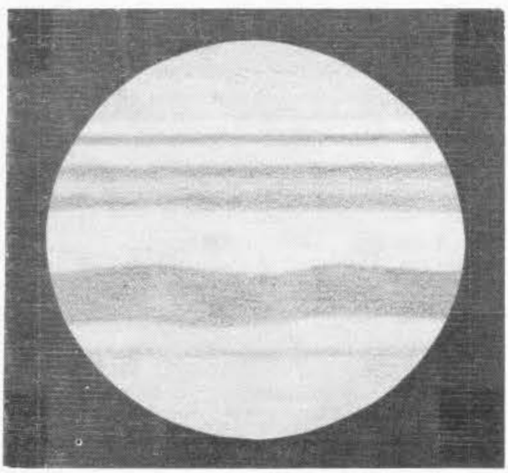


Figure 3. 1-30-56, 14:40 U.T.
CM_1 99°, CM_2 75°, S4-5,180x

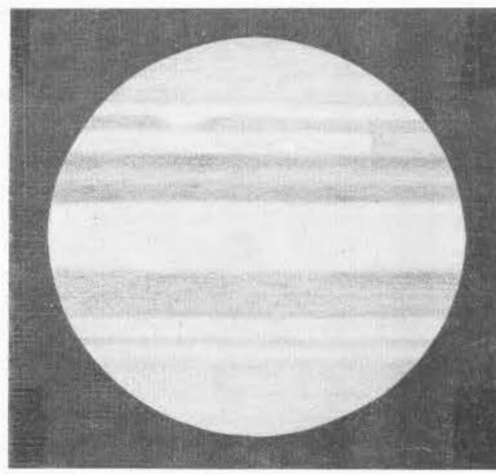


Figure 4. 2-14-56, 13:55 U.T.
CM_1 283°, CM_2 144°, S4-5,180-230x

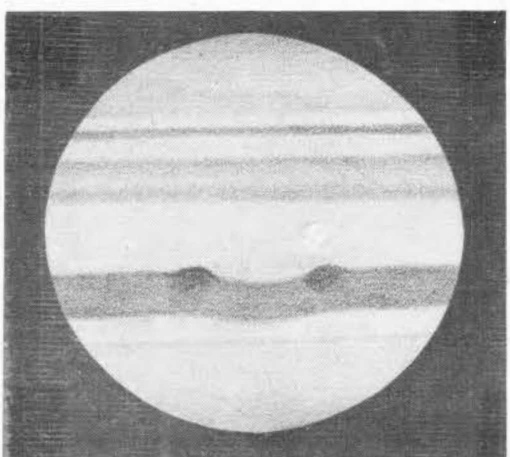


Figure 5. 3-13-56, 13:40 U.T.
CM_1 17°, CM_2 26°, S4-5, 180x

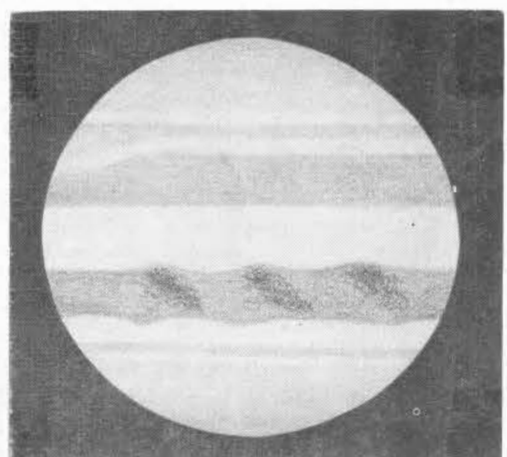


Figure 6. 4-16-56, 10:35 U.T.
CM_1 233°, CM_2 343°, S4-5, 180-230x

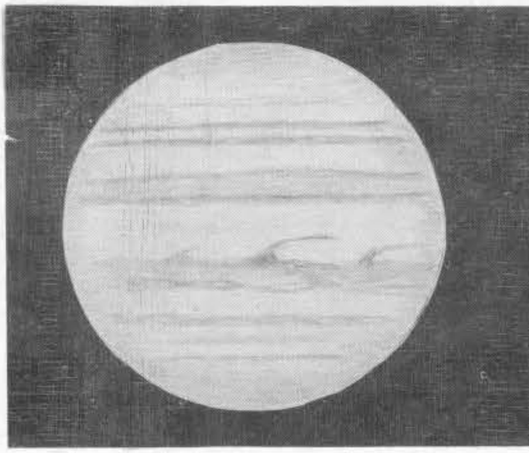


Figure 7. 11-3-55, 14:30 U.T.
CM_1 233°, CM_2 161°, S2T4, 200x

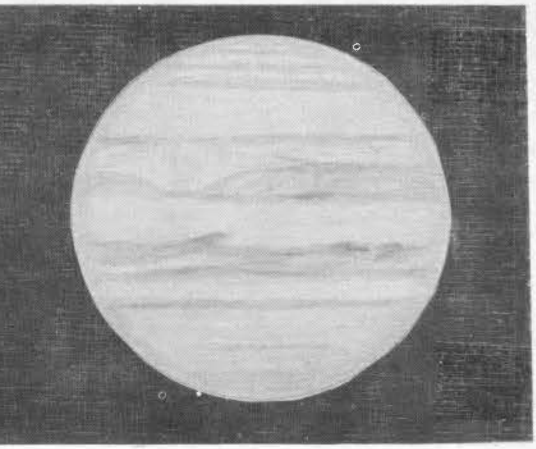


Figure 8. 1-24-56, 6:50 U.T.
CM_1 301°, CM_2 328°, S4, 150x

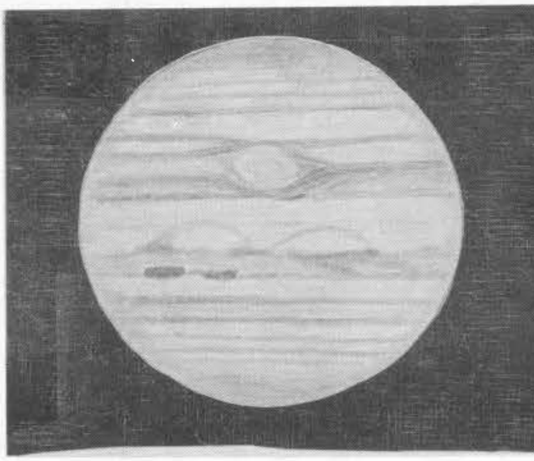


Figure 9. 2-12-56. 6:45 U.T.
CM_1 64°, CM_2 304°, S5T3, 205x

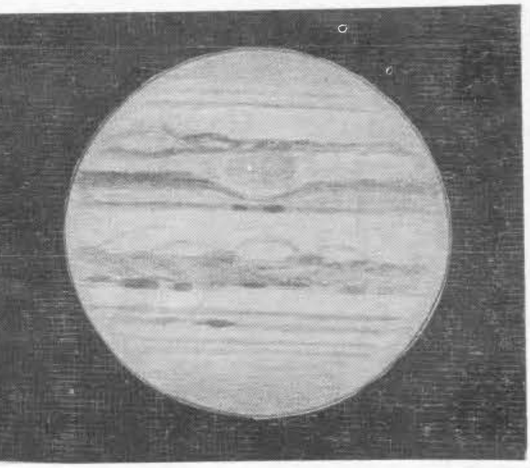


Figure 10. 4-3-56, 3:30 U.T.
CM_1 94°, CM_2 305°, S3-4, 200x

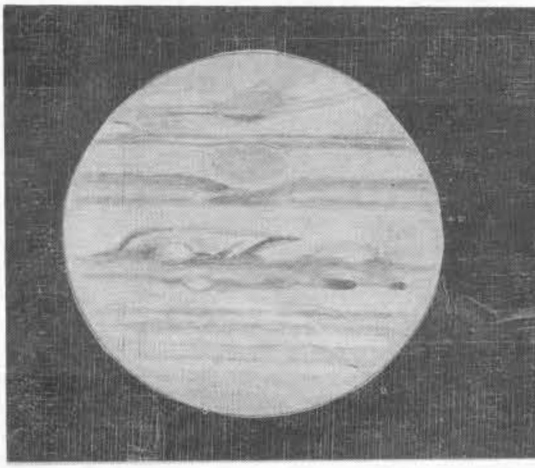


Figure 11. 4-22-56, 4:35 U.T.
CM_1 239°, CM_2 305°, S6, 205x

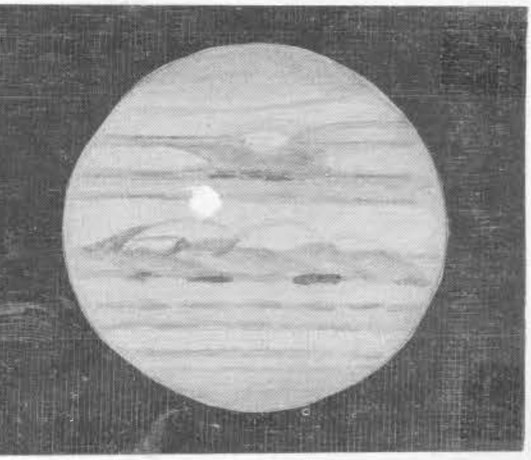


Figure 12. 5-1-56, 3:25 U.T.
CM_1 178°, CM_2 175°, S4, 215x

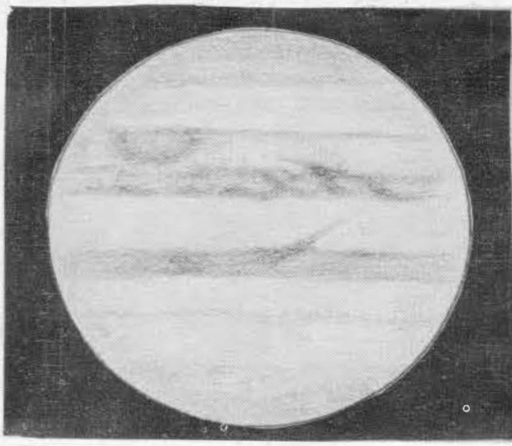


Figure 13. 11-2-55, 19:30 U.T.
CM_1 37°, CM_2 254°, S3-4T5, 230x

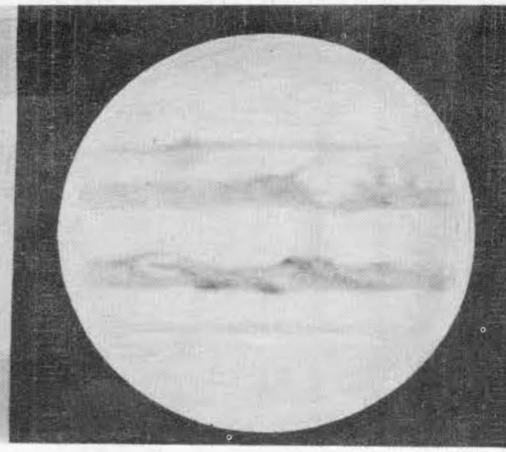


Figure 14. 1-14-56, 17:20 U.T.
CM_1 189°, CM_2 286°, S4T5, 230x

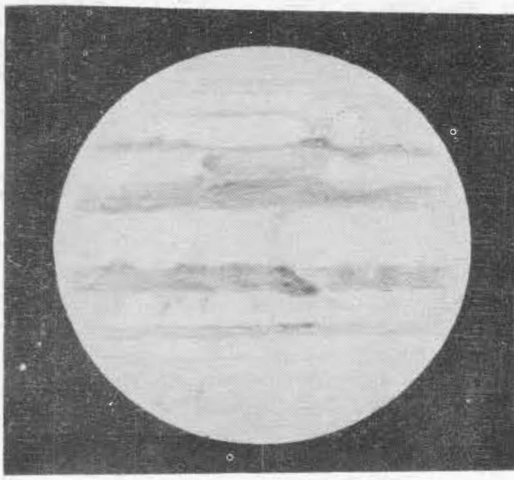


Figure 15. 1-26-56, 15:04 U.T.
CM_1 202°, CM_2 208°, S6T5, 205x

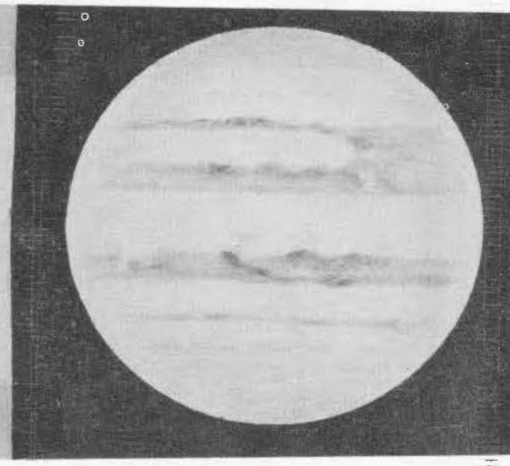


Figure 16. 2-14-56, 14:39 U.T.
CM_1 309°, CM_2 171°, S4-5T3, 230x

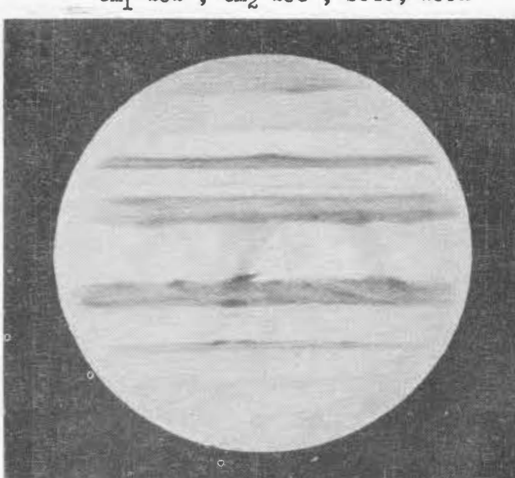


Figure 17. 2-18-56, 15:20 U.T.
CM_1 247°, CM_2 77°, S5T4-5, 230x

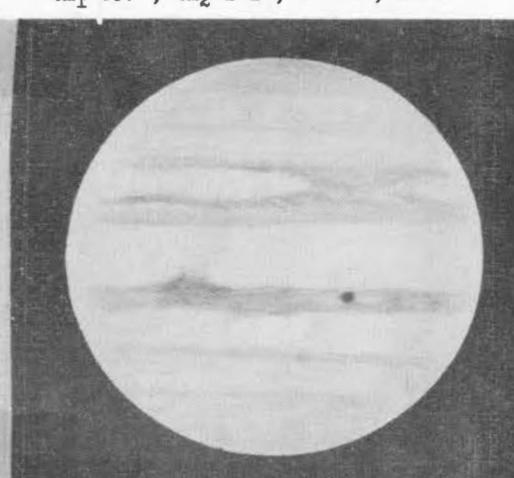


Figure 18. 3-12-56, 13:54 U.T.
CM_1 88°, CM_2 180°, S4-5T3-4, 230x

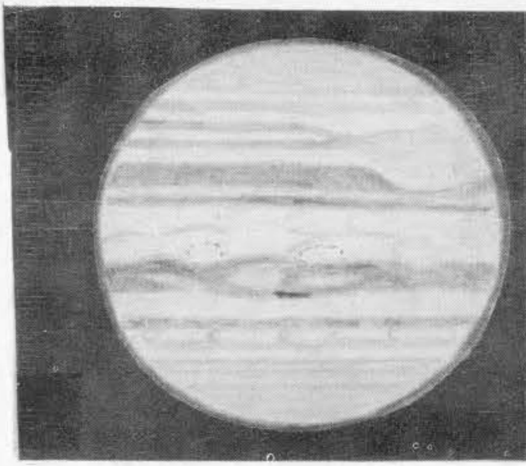


Figure 19. 3-29-56, 3:35 U.T.
CM_1 14°, CM_2 264°, S2-4T5, 177x

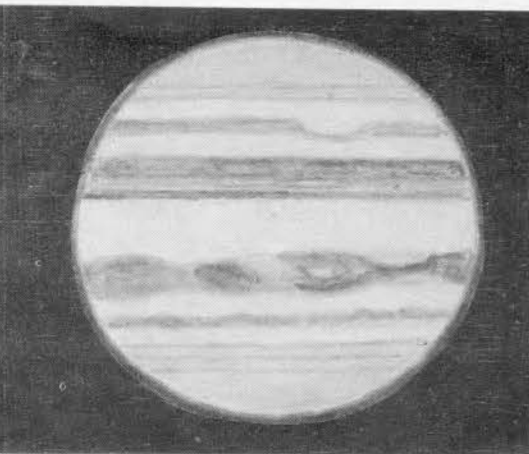


Figure 20. 4-9-56, 2:55 U.T.
CM_1 287°, CM_2 93°, S2-3T5, 272x

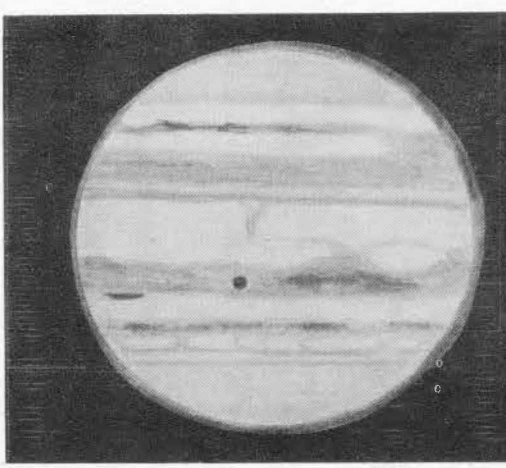


Figure 21. 5-8-56, 3:15 U.T.
CM_1 196°, CM_2 139°, S2-4T5, 177x

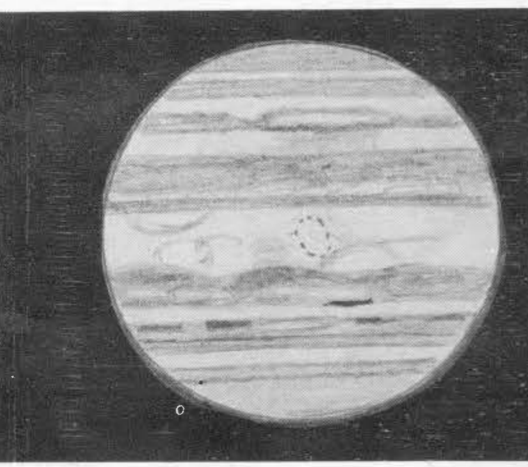


Figure 22. 6-6-56, 3:20 U.T.
CM_1 93°, CM_2 175°, S3-5T5, 177x

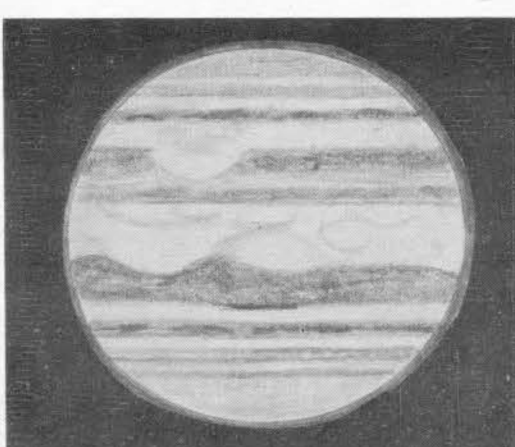


Figure 23. 6-7-56, 3:20 U.T.
CM_1 251°, CM_2 325°, S3-5T5, 232x

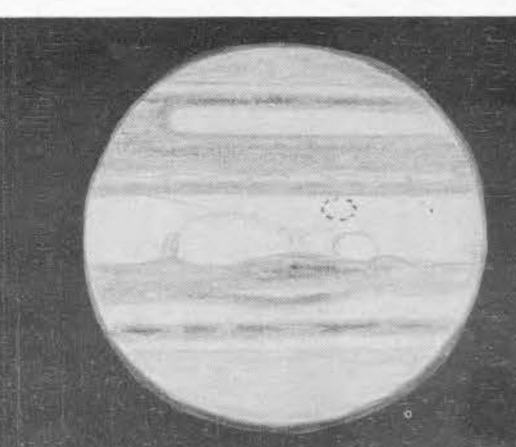


Figure 24. 7-6-56, 3:30 U.T. (?)
CM_1 150°, CM_2 4°, S2-4T5, 264x
12.5-in. refl.

Jean Nicolini	12-in. refl.	São Paulo, Brazil
Toshihiko Osawa	6-in. refl.	Osaka, Japan
Ray Oxford	4-in. refr.	Decatur, Ga.
Edgar .. Paulton	6-in. refl.	Brooklyn, N.Y.
Harold Povenmire	3½-in. & 6-in. refls.	Columbus, Ohio
Owen C. Ranck	4-in. refr.	Milton, Pa.
Clyde H. Ray, III	3½-in. refl.	Waynesville, N.C.
Elmer J. Reese	6-in. refl.	Uniontown, Pa.
Milton Rosenkotter	10-in. refl.	Pierce, Nebr.
Bob Semen	6-in. refl.	Columbus, Ohio
H. T. Sherman	6-in. off axis refl.	St. Paul, Minn.
Stephen Sinotte	6-in. refl.	Keokuk, Ia.
Chester J. Smith	6-in. refr., 20-in. refr.*****	Oakland, Calif.
Robert Somerville	6-in. refl.	New Kensington, Pa.
Steadman Thompson	6-in. refl.,12½-in.refr.****	Columbus, Ohio
Frank Vaughn	10-in. refl.	Madison, Wisc.
William Weaverling	6-in. refl.	Dyer, Ind.
John E. Westfall	4-in. refr.	Oakland, Calif.
Nelson Wilt	12½-in. refr.****	Columbus, Ohio
René Wurgel	3½-in. refl.	Union City, N.J.

* Agnes Scott Observatory.
** Mt. Wilson Observatory.
*** Main Instrument of the University of Alberta Observatory.
**** McMillin Observatory.
***** Chabot Observatory.

General Description

Belts. The NEB was on the average the most conspicuous Belt. However, the combined components of the SEB were at times at least as conspicuous, if not more so, than the NEB. The SEBs was on the average 0.1 units darker than the NEB for the apparition. (Numerical estimates of intensities were based on figures supplied by P.W.Budine, W.H.Haas and E.J.Reese.) Hence, the SEBs was the most intense feature on Jupiter during the 1955-56 apparition.

The figures used in the following discussion are based on the numerical scale of 0 to 10, 0 indicating extremely black (shadow) and 10 extremely bright, the intervening figures, of course, indicating the varying degrees of intensities between 0 and 10.

The order of increasing intensity (increasing intensity means toward the brighter-high numbered-end of the scale) and the colors of the Belts and Zones were as follows (it might be noted that the color estimates are based on data supplied by W. H. Haas and E. J. Reese, Mr. Haas using Kodak Wratten Filters nos. 25, 47 and 58):

SEBs (2.5). This belt was generally described as being Red-Brown but on at least four occasions it was described as being Brownish-Red.

NEB (2.6). This belt fluctuated in color, about evenly between Red-Brown and Brownish-Red.

SEBn (2.8). Red-Brown, generally, but Reese described the belt as being Orange-Brown more than Red-Brown.

STB (3.1). Almost constantly Red-Brown, but on occasion it was seen to be plain Brown and Gray, as Brownish-Gray also.

NTB (3.3). The NTB was seen divided into two components on many occasions. Its color was generally described as being Red-Brown, but it was also seen to be plain Brown and Gray at times.

SSTB (3.7). There is only one estimate of color for this Belt. It was described as being Bluish on March 15, 1956. Also, this Belt was not seen very many times.

SSSTB and NNNTB (3.7). These two Belts were the same as regards intensity and color. However, the SSSTB was seen by far the more times. Their colors were, generally, Red-Brown. The SSSTB was Brown on at least two occasions.

NNTB (3.8). Red-Brown. Not seen very often.

EB (3.9). This Band became more prominent as the apparition progressed. It was broken on many of the occasions it was seen. Its color, based on one estimate, was Red-Brown.

SEBz (4.0). A pale Red-Brown.

NTeZ (4.9). White.

NNTeZ (5.0) White.

STeZ (5.1). White.

SSTeZ (5.2). White.

STrZ (5.4). White.

NTrZ (5.8). White. On two occasions in May (23rd and 28th), 1956 it was very bright and White, being estimated at 7.5. Also it was described as being extremely bright on June 3, 1956; no numerical estimate was made. On June 24, 1956 it was estimated as being 7.0.

EZ (6.9). White. Mr. Reese consistently described this Zone as being the brightest Zone. He recorded it as being 8.0 or brighter on every occasion he made estimates. The dates and times of Mr. Reese's estimates are as follows:

Date	Time (U.T.)	Intensity
Oct. 3, 1955	10:08	8.0
" 27, 1955	10:44	8.5 White!
Jan. 15, 1956	3:38	8.5 White!
" 28, 1956	3:29	8.0
Feb. 24, 1956	4:19	8.0
Mar. 20, 1956	2:45	8.5 White!
Mar. 21, 1956	4:26	8.5
May 4, 1956	1:42	8.0

However, Mr. Haas' estimates were lower and his average was only 5.5; he recorded the NTrZ as being the brightest Zone.

The Polar Regions were about the same as regards intensity and color. The SPR was the darker (4.4), and the NPR was 4.2. Their color fluctuated between Purplish-Gray, Gray and Grayish-Purple.

The South Tropical Zone Disturbance (STrZD). This Disturbance had on the average an intensity of 3.8 and was described as being Brown or Reddish-Brown in color. The STrZD was fading toward the last of the apparition. It was estimated as low as 3.0 when it first came under observation, but had faded to 4.75 by the end of the apparition. See Rotation Periods, of this Report, for a more complete description of this feature.

Red Spot Hollow. This feature remained fairly constant during the apparition, having an average intensity of 5.5 for the interior of the Hollow. Its border was darker. Toward the end of the apparition a faint Spot was detected, at times, within the Hollow; it had an intensity of 4.0 to 4.5 and was of a rather tannish color.

Rotation Periods, 1955-56

This portion of this Report has been written by Mr. Elmer J. Reese.

It is encouraging to report that more observers obtained more transits during the apparition under review than in any other apparition since that of 1949. Thirteen observers have submitted a total of 1926 transits. When plotted on graph paper, 798 of these transits form usable drifts for 41 Jovian marks. As a general rule, a reliable drift is one that extends over an interval of at least 30 days and contains three or more apparently related transits for each 30 days of its observed life. Some of the highlights of the apparition follow:

1. The appearance of a new Disturbance in the S. Tropical Zone which greatly resembled the famous S. Tropical Disturbance of 1901-1939.

2. The N. Tropical Current was very active after several years of comparative quiescence. The mean rotation period of this current was found to be quite normal; however, two objects displayed unusually short periods.

3. The observed mean rotation period of the N. Equatorial Current has been erratic during the last three apparitions (see the summary at the end of this section).

4. The three long-enduring white areas in the northern part of the S. Temperate Zone were once again well observed. The average length of these white areas, which had been steadily decreasing from 93° in 1940 to 25° in 1953, has apparently become stabilized at about 22°. These long-enduring areas have taken on a new importance because it is now believed that they may be sources of radio noise (1, 2).

Two of our longitude charts are reproduced below - one for the N. Tropical Current and one for the preceding and following ends of the STrZ Disturbance and the Red Spot Hollow.

In the tables which follow the first column gives an identifying number or letter to each object. The second column indicates whether the object was dark (D) or bright (W) and whether the preceding (p), center (c) or following (f) end was being observed. The third column gives the first and last dates of observation; the fourth column, the longitudes on those dates. The fifth column gives the longitude at opposition, February 16, 1956. The seventh column indicates the number of degrees in longitude that the marking drifts in 30 days.

If we let $\pm$D represent the drift in either system of longitude in 30 days, the corresponding rotation period can be found with sufficient accuracy from the following formulae:

System I. Rotation Period = $9^h\ 50^m\ 30.003s + 1.345s\ (\pm D)$
System II. Rotation Period = $9^h\ 55^m\ 40.632s + 1.369s\ (\pm D)$

S. S. Temperate Current (SSTB), System II

No.	Mark	Limiting Dates	Limiting L.	L.	No. Transits	Drift in 30d.
1	Dc	Mar. 10-Jun. 7	352° - 272°	(13°)	9	-27°.0

Rotation Period $9^h\ 55^m\ 4s$

S. Temperate Current (S. edge STB, STeZ), System II

No.	Mark	Limiting Dates	Limiting L.	L.	No. Transits	Drift in 30d.
F	Wp	Oct. 9-Jun. 8	214° - 48°	127°	28	- 20°.5
2	Wc	Oct. 9-Jun. 8	223 - 59	137	24	- 20 .3
A	Wf	Oct. 9-Jun. 8	231 - 70	147	29	- 19 .9
B	Wp	Oct. 22-May 4	319 - 163	227	17	- 24 .0
5	Wc	Oct. 22-May 4	329 - 175	238	7	- 23 .7
C	Wf	Oct. 22-May 4	339 - 187	248	20	- 23 .4
D	Wp	Oct. 27-May 4	32 - 237	298	17	- 24 .5
8	Wc	Oct. 27-May 4	41 - 249	310	10	- 24 .0
E	Wf	Oct. 27-May 7	50 - 254	322	23	- 24 .6

Mean drift in 30 days - 22°.8
Mean rotation period $9^h\ 55^m\ 9.4s$

The appearances of the three long-enduring white areas, FA, BC and DE, had changed very little since the previous apparition. The white area, BC, was in conjunction with the Red Spot Hollow on November 27; DE was in conjunction with the Hollow on February 27.

S. Tropical Zone Disturbance, System II

No.	Mark	Limiting Dates	Limiting L.	L.	No Transits	Drift in 30d.
1	Dp	Oct. 9–Jun. 28	223° - 151°	185°	68	- 8°.2
2	Dc	Sep. 19–Jun. 28	245 - 167	204	45	- 8 .3
3	Df	Oct. 9–Jul. 5	239 - 179	223	57	- 6 .7

Mean drift in 30 days - 7°.7
Mean rotation period $9^h\ 55^m$ 30s.

The STrZ Disturbance was first seen on September 19 at longitude (II) 245° by the well-known English observer, Mr. B. M. Peek (3). The Disturbance was first seen in America by W. H. Haas and E. J. Reese on October 9 when it appeared as a dark area in the S. Tropical Zone centered near 230° (II) with an overall length of about 17°. From early January to mid-March the length remained constant near 38°. By late June the length had decreased to about 30°. Bright oval-shaped spots in the S. Tropical Zone at both ends of the Disturbance gave it an appearance reminiscent of the S. Trop. Disturbance of 1901-1939. In some other respects, however, the new Disturbance somewhat resembled the S. Trop Streaks of 1941-2 and 1946-7. It may be a coincidence that a slightly accelerating drift line having a mean period of $9^h\ 55^m$ 21s would pass through the plotted longitudes of the two S. Trop. Streaks and the longitude where the present Disturbance first appeared. The present Disturbance, with its mean rotation period of $9^h\ 55^m$ 30s, has been drifting more slowly in decreasing longitude than did the earlier S. Trop. Streaks which had periods near $9^h\ 55^m$ 24s. It should also be mentioned that the present STrZ Disturbance appeared close to the longitude (II) where the SEB Disturbance of 1955 had originated - indeed it appeared within 7° of a "least squares line" passing through the initial longitudes of the great SEB Disturbances of 1928, 1943, 1949, 1952 and 1955.

Red Spot Hollow, System II

No.	Mark	Limiting Dates	Limiting L.	L.	No. Transits	Drift in 30d.
1	Wp	Oct. 9–Jun. 29	285° - 288°	287°	44	+ 0°.3
2	Wc	Oct. 9–Jun. 29	299 - 301	300	38	+ 0 .2
3	Wf	Oct. 9–Jun. 29	313 - 315	314	48	+ 0 .2

Mean drift in 30 days + 0°.2
Mean rotation period $9^h\ 55^m$ 41s.

Although the Red Spot was frequently seen as a faint dusky oval in the S. Tropical Zone, the Red Spot Hollow or Bay in the southern part of the S. Equatorial Belt was predominant.

Middle of the South Equatorial Belt, System II

1	Wp	Jan. 1–Feb. 22	227° - 212°	214°	5	- 8°.7
2	Wc	Jan. 1–Apr. 12	231 - 205	220	8	- 5 .8
3	Wf	Jan. 1–Feb. 22	235 - 225	226	6	- 7 .7

Mean drift in 30 days - 7°.4
Mean rotation period $9^h\ 55^m$ 31s.

These three drifts pertain to the center and preceding and following ends of a whitish cloud-like area extending over some 12° of longitude and located in the SEB just south of the SEBn. In recent years the observed rotation period for this latitude has been a minute or two shorter than that for System II; however, this object remained in conjunction with the following end of the STrZ Disturbance. It seems probable that this cloud was in some way associated with the Disturbance.

North Equatorial Current (S. edge NEB), System I

No.	Mark	Limiting Dates	Limiting L.	L.	No. Transits	Drift in 30d.
1	Dc	Dec. 26–Jun. 8	30° – 36°	32°	17	+1°.1
2	Wc	Dec. 11–Jun. 13	45 – 55	48	13	+1 .6
3	Dc	Dec. 26–Apr. 23	68 – 70	69	12	+0 .5
4	Wc	Dec. 11–Jun. 13	81 – 78	80	6	–0 .5
5	Dc	Mar. 18–Jun. 7	170 – 175	(168)	8	+1 .9
6	Wc	Nov. 6–Jun. 7	179 – 181	180	8	+0 .3
7	Dc	Oct. 9–Jun. 7	185 – 206	203	16	+2 .6
8	Wc	Nov. 6–May 3	211 – 218	215	13	+1 .2
9	Dc	Nov. 6–May 29	230 – 234	235	21	+0 .6
10	Wc	Nov. 6–Jun. 5	252 – 244	250	11	–1 .1
11	Dc	Mar. 21–Jun. 12	284 – 303	(276)	10	+6 .9
12	Wc	Mar. 27–Jul. 5	304 – 320	(295)	6	+4 .8
13	Dc	Mar. 20–Jul. 5	327 – 340	(323)	8	+3 .6
14	Wc	Mar. 10–Apr. 14	341 – 344	(340)	6	+2 .6

Mean drift in 30 days +1°.9
Mean rotation period 9^h 50^m 32s.

North Tropical Current (N. edge NEB), System II

No.	Mark	Limiting Dates	Limiting L.	L.	No. Transits	Drift in 30d.
1	Dc	Mar. 15–Jun. 12	32° – 319°	(55°)	16	–27°.7
2	Dc	Jan. 28–Jun. 12	130 – 79	123	25	–11 .2
3	Dc	Nov. 22–May 20	246 – 169	206	35	–12 .8
4	Wc	Nov. 22–May 4	256 – 185	219	14	–13 .0
5	Dc	Nov. 22–May 23	300 – 247	275	28	–8 .7
6	Dc	Jan. 24–Mar. 27	301 – 278	293	8	–11 .0
7	Dc	Apr. 1–May 31	356 – 302	(37)	7	–27 .0

Mean rotation period (without Nos. 1 & 7) 9^h 55^m 25s.
Rotation period of Nos. 1 & 7 only 9^h 55^m 3s.

North Temperate Current (N. edge NTB), System II

No.	Mark	Limiting Dates	Limiting L.	L.	No. Transits	Drift in 30d.
1	Dp	Jan. 1–Apr. 27	156° – 240°	188°	7	+21°.5

Rotation period 9^h 56^m 10s.

Summary of Mean Rotation Periods, 1949 to 1955–56

Feature	1949	1950*	1951–52*	1952–53	1953–54	1954–55	1955–56
SSTB	9:55:04	9:55:07	—	—	—	—	9:55:04
STBs, STeZ	9:55:09	9:55:10	9:55:11	9:55:11	9:55:13	9:55:12	9:55:09
RS or RSH	9:55:43	9:55:42	9:55:42	9:55:42	9:55:43	9:55:44	9:55:41
STrZD	—	—	—	—	—	—	9:55:30
STrZ (p. RS)	9:54:24	—	—	9:54:53	9:54:40	—	—
STrZ (f. RS)	9:55:47	—	—	9:55:49	9:55:41	—	—
S edge SEBs	9:55:47	—	—	—	—	—	—
N edge SEBs	—	9:55:24	—	—	—	—	—
middle SEB	9:54:27	—	—	9:54:13	—	9:54:11	—

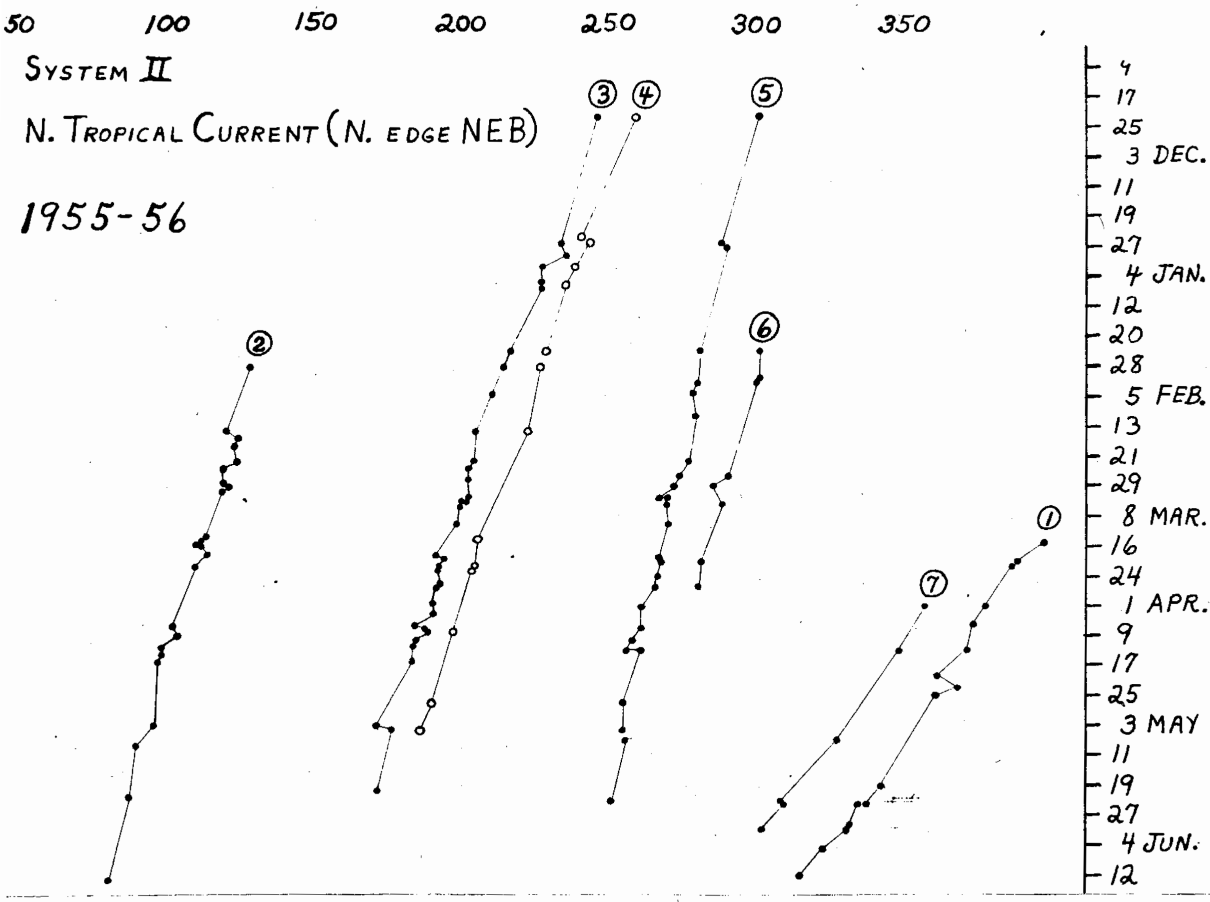


Figure 26.

Feature	1949	1950*	1951-52*	1952-53	1953-54	1954-55	1955-56
N edge SEBn	9:50:14	9:50:51	9:50:49	9:50:27	---	---	---
S edge NEB	9:50:18	9:50:19	9:50:19	9:50:21	9:50:38	9:50:16	9:50:32
middle NEB	9:53:51	---	9:53:19	9:52:40	---	---	---
N edge NEB	9:55:32	9:55:16	---	9:55:24	9:55:31	9:55:31	9:55:25
N edge NTB	9:56:04	---	9:56:01	9:55:57	---	---	9:56:10
NNTB	9:55:43	9:55:39	---	---	---	---	---
NNNTB	---	---	9:55:17	9:55:23	---	---	---

*Data incomplete for these apparitions.

References

(1) The Strolling Astronomer, Vol. 10, p. 13.
(2) JBAA., 66 (6), p. 208.
(3) W.E. Fox, Private Correspondence, Dec. 10, 1955.

Satellite Phenomena

Three of the Galilean Satellites went through a series of mutual occultations during the spring months of 1956. Twenty-six such phenomena were predicted in the 1956 Handbook of the British Astronomical Association. Twenty of these occultations involved J. I and J. II, J. I in each case being occulted by J. II. The other six occultations involved J. II and J. III, J. III being occulted by J. II.

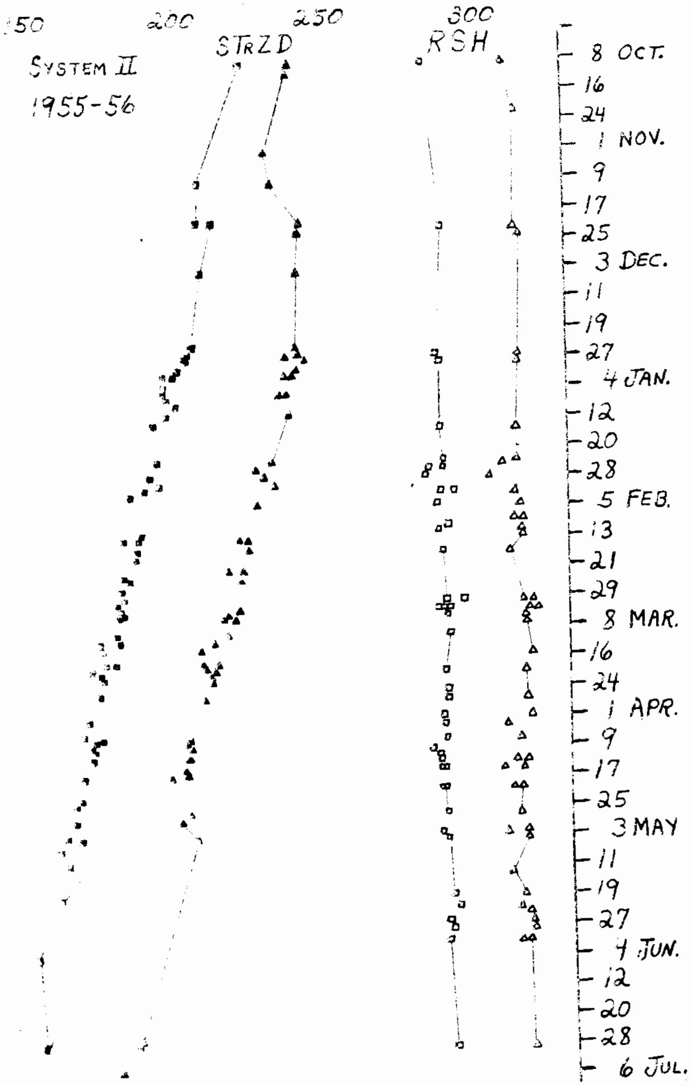


Figure 27

We are sorry to report that these mutual phenomena were not very well observed. Correspondence with active observers in the United States indicates that a large portion of these phenomena which were visible in this country went unobserved because of bad weather. However, we do have the reports of a few observers.

Walter H. Haas observed three of the mutual occultations. His notes are as follows:

"April 23, 1956. Occultation of J. I by J. II, 6-inch refl., 298X, S 3-5, T 4. First contact was observed at 4:59.6±0.7, U.T. (predicted time by H.B.A.A. 5:01). A single round satellite was remarked from 5:04 to 5:08. Last contact was observed at 5:11.0±0.9 (predicted time by H.B.A.A. 5:12). My estimate is that the center of I passed to the north of the center of II by about 1/3 or ¼ the diameter of either. If so, the occultation was not total. No unusual appearances were noticed during the course of the occultation.

"May 3, 1956. Partial occultation of J. III by J.II. 6-inch refl., 298X, S 4-5, T 4. External contact was observed at 5:29.6±1.3, U.T. (predicted time by H.B.A.A. 5:30). By 5:37 the two satellites looked like one. Last contact was observed at 5:55.0±1.5 (predicted time by H.B.A.A. 5:55). J.II had a much brighter surface than J. III, but there was very little difference in color (both yellow). I should estimate that at mid-occultation the center of II lay to the south of the center of III by perhaps 30% of the diameter of III. No unusual or unexpected appearances were seen at any time.

"May 4, 1956. Occultation of J. I by J. II. 12.5-inch refl. 202X, 303X. S 3-4, T 1-2. It was impossible to time first contact, which occurred with both satellites beginning to transit their primary. J. II was seen until about 5:00,U.T. Phenomenon predicted to last from 4:50 to 5:18, U.T. Nothing more seen of either satellite."

John E. Westfall made sketches at one-minute intervals of two of the mutual occultations.

March 22, 1956. Occultation of J. I by J. II. 4-inch refr. 720X. S 7, T 5. Sketches indicate that first contact was made at approximately 6:23, U.T. (H. B. A. A. predicted time 6:28). By 6:28 the two satellites appeared to Westfall as one slightly elongated satellite. The last contact was observed at approximately 6:35 (H.B.A.A. predicted time 6:32).

March 29, 1956. Occultation by J. I by J. II. 4-inch refr. 720X. S 5, T 4. The sketches indicate that first contact was made at approximately 8:37, U.T. (H. B. A.A. prediction 8:40). From 8:40 to 8:45 the two satellites appeared to Westfall as one. Last contact on the sketches was at approximately 8:46 (H.B.A.A. prediction 8:46).

Westfall remarked that the abnormally high power was used to determine the relative positions of the two satellites more accurately.

Chester J. Smith observed the occultation of J. III by J. II on May 3, 1956. 6-inch refr., 425X. First contact was observed at 5:34, U.T. (predicted time 5:30). J. II was centrally placed on J. III at 5:41, the centers of the two satellites being separated by about 10% of the diameter of III. The center of J. II lay to the north of the center of J. III. Last contact was observed at 5:48 (predicted time 5:55). Smith made the following remarks: "Seeing was excellent at time of observation. . . . . . J. II appeared white, J. III appeared orange. No markings of any kind seen on J. III, but J. II was seen in higher contrast."

It will be noted that this occultation of III by II on May 3 was also observed by Haas, and readers might like to compare Smith's description with Haas' above.

Two observers witnessed four unpredicted satellite phenomena. David Meisel observed an appulse of J. I and J. II on January 27, 1956. He observed the satellites to be in external contact at approximately 0:10, U.T. On April 22, 1956 Meisel observed an occultation of J. I by J. II. First contact was observed at approximately 2:46, U.T. The last contact was not observed. On June 8, 1956 Meisel recorded an appulse of J. II to J. I. His sketches show satellites designated as Io (J. I) and Europa (J. II) to come very close to external contact from 1:39 to 1:47, U.T.

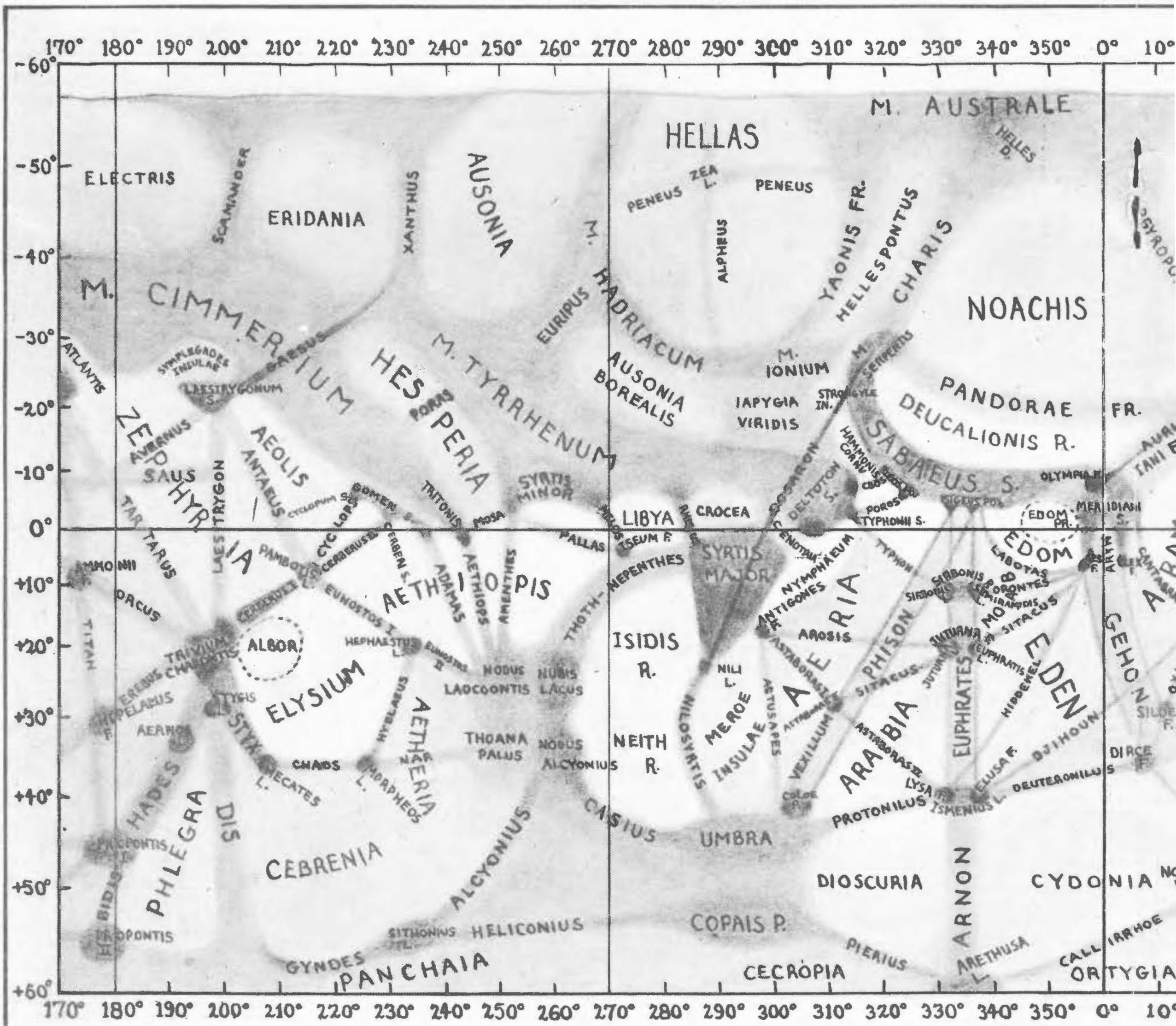
Leonard Gordon observed what might have been a mutual occultation of J. III by J. IV. On June 9, 1956 at 1:33, U.T. Gordon observed in a 4-inch reflector that only one satellite was visible where there should have been two. However, he noted that this satellite (designated by him as J. III) had a slightly elongated shape On directing his attention to the same area 23 minutes later, he discovered two satellites (III and IV), slightly separated. It is difficult to state that an occultation actually did occur, but it is possible that one did.

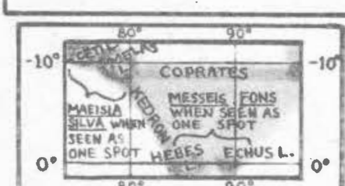
Note by Editor. There would appear to be some false identifications of the satellites with the four unpredicted phenomena. What Meisel observed on June 8, 1956 was almost certainly a view of the occultation of III by II predicted in H.B.A.A. to last from 1:42 to 1:48, U.T. Unless the 1956 A.E.N.A. chart on pg. 481 of that volume is in error, J. I and J. II were well separated at that time. Likewise, I and II were on opposite sides of Jupiter at 2:46, U.T. on April 22, 1956, although I and III were fairly close together then, pp. 476 and 477 of the 1956 A.E.N.A.

Latitudes of Belts

We have one set of micrometric measures of latitudes on Jupiter during the 1955-56 apparition. These were made by Mr. Thomas Cragg with the Griffith Observatory 12-inch Zeiss refractor on March 27, 1956. The mean time of the measures is $7^h 10^m$, U.T., C.M. = 51° in System I and 32° in System II. Reduced by a method which considers the ellipsoidal form of Jupiter and corrected for the tilt of the axis of the planet ($0^{\circ}.6$ at the time), the measures give the following jovicentric latitudes:

Feature	Jovicentric Latitude
S. S. Temp. B.	$43^{\circ}.1$ S.
S. Edge S. Temp. B.	$29^{\circ}.5$ S.
N. Edge S. Temp. B.	$24^{\circ}.7$ S.
S. Edge S.E.B.	$19^{\circ}.5$ S.
Center Streak in S.E.B.	$12^{\circ}.5$ S.
N. Edge S.E.B.	$9^{\circ}.9$ S.
E.B.	$0^{\circ}.3$ S.





Details of the Coprates Triangle area

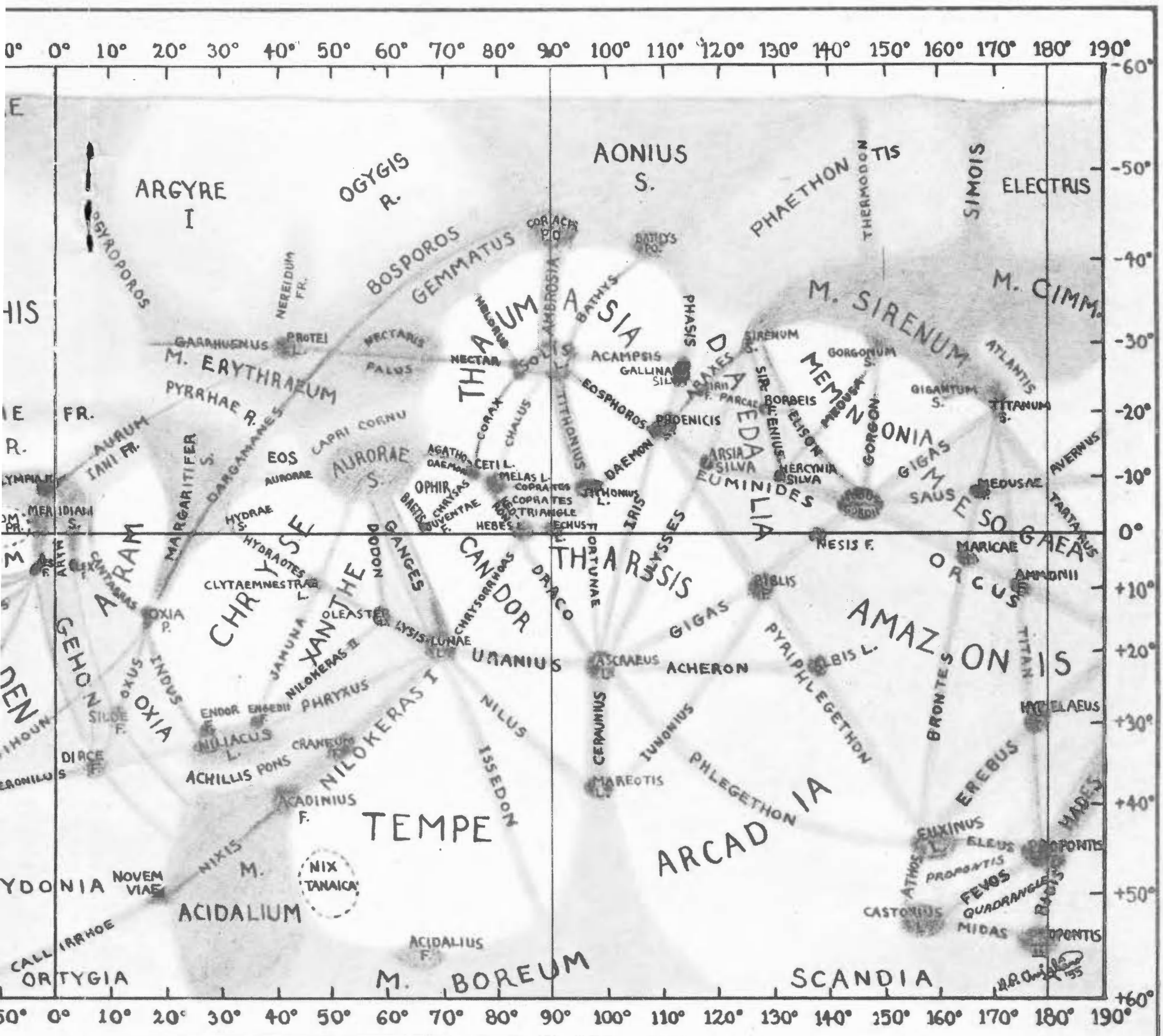
Names of features based primarily on the nomenclatures of Lowell and Antoniadi. Additional names by S. Ebisawa, T. R. Cave, Jr., and D. P. Avigliano.

MARS — APPARITION

Showing individually confirmed det
of the Association of Lunar and

Abbreviations used:

M.—Mare	L.—Lacus
FR.—Fretum	S.—Sinus
F.—Fons	PO.—Portus
R.—Regio	PR.—Promo
P.—Palus	IN.—Insulae
D.—Depressio	

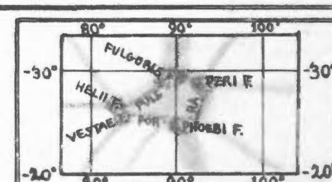


PARITION OF 1954

onfirmed details seen by members
Lunar and Planetary Observers

breviations used:
L.—Lacus
S.—Sinus
PO.—Portus
PR.—Promontorium
IN.—Insulae
.—Depressio

For greater clarity the contrast of the fainter details has been increased in relation to the darker regions.



Details in the Solis Lacus

Feature	Jovicentric Latitude
S. Edge N.E.B.	6.°2 N.
N. Edge N.E.B.	12.°0 N.
S. Edge N. Temp. B.s	22.°5 N.
N. Edge N. Temp. B.s	22.°6 N.
Center N. Temp. B.n	30.°2 N.
N. P. R. (S. edge?)	48.°9 N.

On October 26, 1956 Mr. Cragg wrote about these measures in part as follows:

"The time of the observations would naturally be different for each latitude measured. The C.M. should not be considered any better than several degrees because it takes the better part of thirty minutes to make all the necessary measures .... It would have been nice had I been able to get more micrometer measures, but this requires some very good seeing to give responsible results. I wouldn't consider trying to make measures with seeing less than 5 on the Mount Wilson scale, which corresponds to about 7 or 8 on the A.L.P.O. scale. As you may know, the micrometer reads to four places; and the scatter in the settings from which the preceding reductions were made was frequently in excess of 2 in the third place!"

Measures of latitudes on Jupiter and Saturn would constitute excellent observational work for A.L.P.O. members owning micrometers or having access to professional instruments equipped with them.

VENUS - THE UNKNOWN PLANET

by James C. Bartlett, Jr.

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

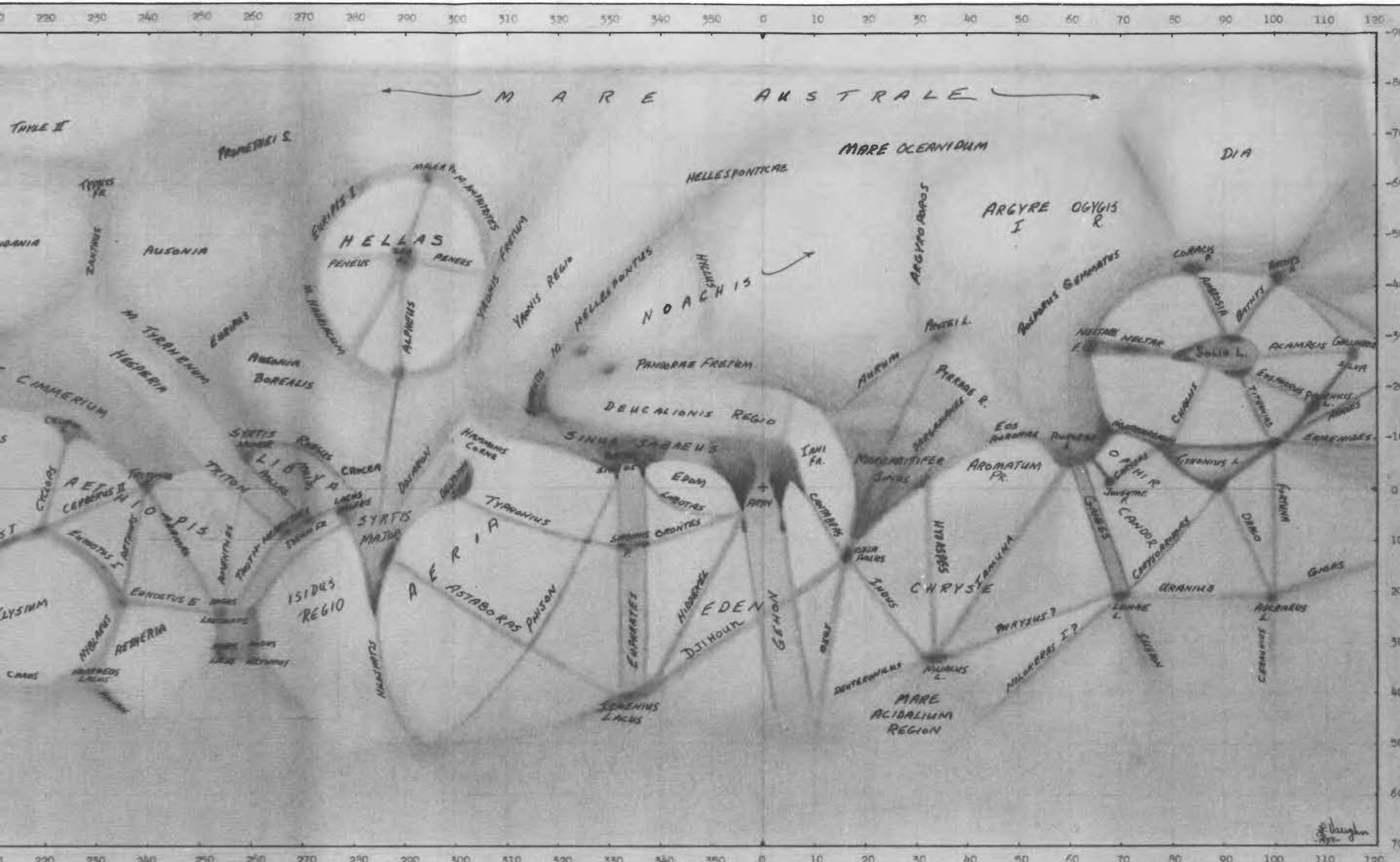
It is at once a real pleasure and an honor to present this little paper to the first Convention of the A.L.P.O., which presentation is by invitation of Prof. Haas, our capable Director. And though I find it impossible to be among you personally, I think you know that you have my very best wishes for the success of the meeting as you have my very best wishes to all.

In a very real sense it is fitting that a paper dealing with Venus should be read before a Convention assembled at Flagstaff; for it was here, over fifty years since, that Percival Lowell first described the markings of Venus in terms which have recently had an echo abroad in the work of Mr. Richard Baum, the gifted English observer. But of that more anon.

The title of this paper is no mere literary whim. Venus <u>is</u> an unknown planet, notwithstanding that it comes closer to us than any other major planet and notwithstanding that it may be observed easily for several months at a time. Yet we know almost as little of it as we do of Pluto, which cannot even be seen with ordinary apertures. The reason for this unsatisfactory state of affairs is partly because Venus is an interior planet, and therefore when closest and when its apparent diameter is greatest also presents its least area of illuminated surface. But another and equally important reason lies in the remarkable opacity of the Venusian atmosphere, which conceals from us all but the most tantalizing clues to the nature of the surface beneath the shining veil. Even the spectroscope has largely failed us.

Beyond the elementary facts of diameter, mass, volume, orbital eccentricity and velocity, and the synodic and sidereal periods, we have as yet no exact knowledge of the planet - and even the mass is subject to the degree of uncertainty which attaches to any planet lacking a satellite. Does any one know the diurnal period? The inclination? The surface conditions? The composition of the atmosphere? Whether water is present? If so, I am not acquainted with him.

By the same token Venus presents one of the most difficult challenges in the entire solar system, and we in the Venus Section of the A.L.P.O. have accepted that



MARS, 1956--ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS

s submitted by
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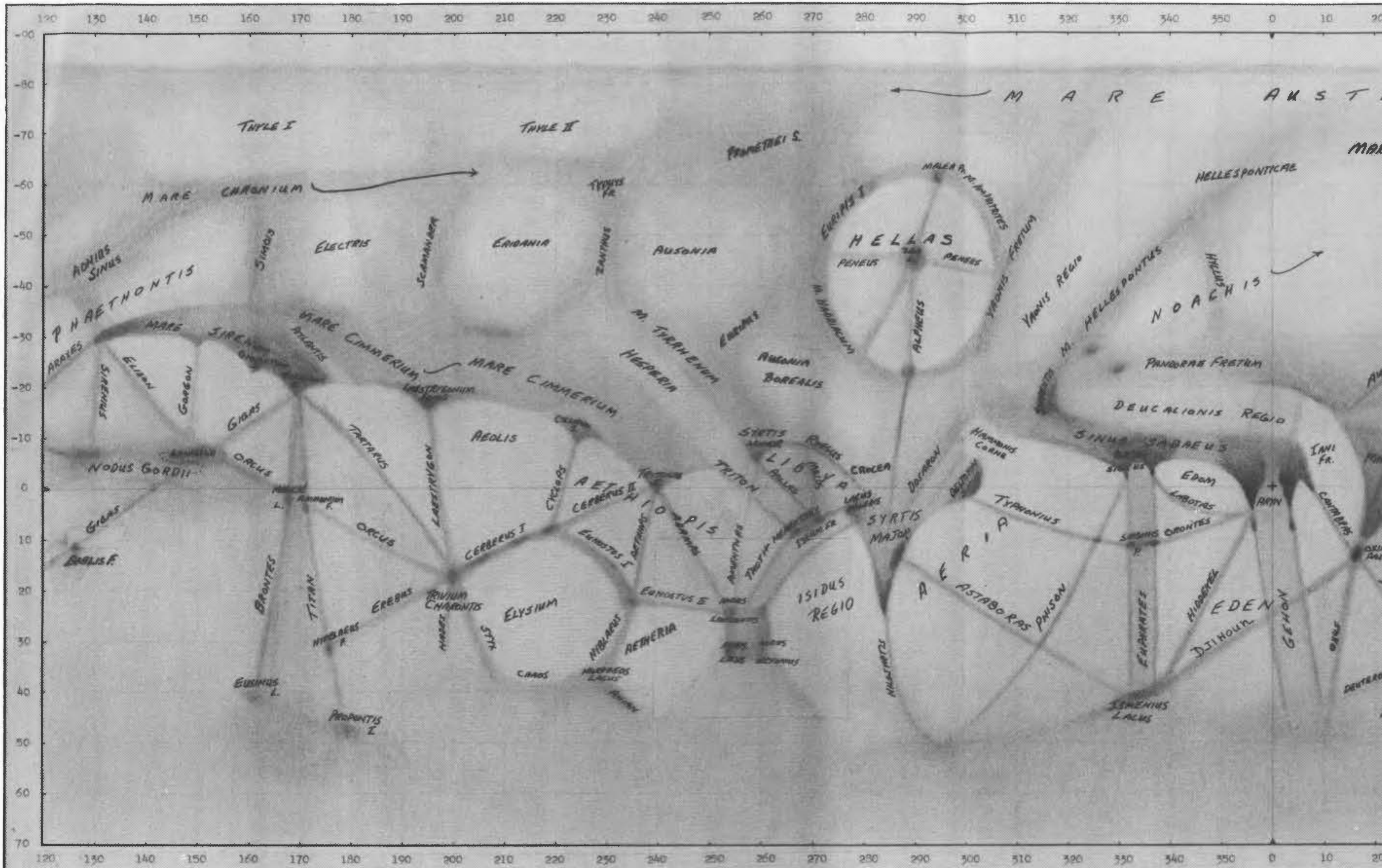
to short-period variations and it is felt that confusion results from too great zeal in naming formations which must be regarded as secondary to more prominent regions in which they are located. In general, Mars was not so well seen in 1956 as in some past Perihelic oppositions because of extensive atmospheric obscurations near opposition.

Much time was given to a study of the "New" features northeast of the Syrtis Major. The map-maker regards this region as needing much study and careful analysis, especially in the context of earlier work. In some regions a reversion to earlier names has been effected, where it is thought that subsequent renaming lacked justification.



MARS, 1956--ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS

Features depicted are based on a selection from approximately 1200 drawings submitted by Alpo members and others, measures of drawings and photographs and past maps. In general, two or more observations of a feature were required to place it on the chart. Some of the "newer" features are left unnamed, for some local regions of mars are subject to short-period variations and it is felt that confusion results from too great zeal in naming formations which must be regarded as secondary to more prominent regions in which they are located. In general, Mars was not so well seen in 1956 as in some past Perihelic oppositions because of extensive atmospheric obscurations near opposition.

Much time
map-maker
the context
where it is

challenge. It would be foolish to suppose that our labors will shortly supply the answers to all of the questions asked above. Indeed, by the very nature of the subject, it is more probable that definite answers will not be forthcoming for many years. In the meantime, however, we can do much valuable spade work by determining the most fruitful methods of attack; by establishing what are and are not significant areas of observation; by learning to distinguish the objective from the subjective in Venusian features; and above all by compiling a detailed and consistent record of the planet over a long period of time.

Among the more important features deserving of close investigation are the apparent polar caps, or cusp-caps as they are called. These are two areas of greater-than-average brightness which always occupy positions at the poles of the disc and therefore are always 180° apart. This fact alone is of some significance as indicating a degree of permanency,and while many authorities have dismissed them as being wholly illusionary it is my own thought that the weight of historical evidence is against this view. The cusp-caps were in fact discovered by Gruithuisen and have since been repeatedly figured by respectable observers including Mascari and Lowell.

The difficulty in observing them arises wholly through their lack of color contrast with the contiguous surface. Unlike the polar caps of Mars, which stand out so vividly against the red desert, the Venusian cusp-caps are distinguishable only because they are often somewhat brighter, or at least whiter, than the surrounding surface. But the degree of difference is slight and they are at all times difficult. However, I have found that a blue or green filter will often brighten them relatively and so render them more conspicuous.

The importance of these caps lies in their relation to the axis of rotation; for if they can be established as permanent features always 180° apart and always at the poles of the disc, then it follows that they must also mark the poles of rotation and thus we are led to a solution of the mystery of the inclination. There are several reasons for supposing that these cusp-caps may be true polar caps. On going over A.L.P.O. records, one is struck by the high degree of unanimity with which their characteristics are reported. Thus the south cap is generally recorded as the larger and the brighter of the two, and the south cusp-band, a narrow, dark area bordering the south cap on the north, is almost always reported, while the corresponding north cusp-band is much less frequently noticed - a finding which accords perfectly with my own records.

In 1954 D. P. Avigliano made a prolonged and careful study of the cusp-caps (to be reported in a forthcoming Venus article for The Strolling Astronomer), during which he distinguished separate areas of differing intensity within the caps. R. M. Baum also detected a dark, rift-like marking in the south cap which appears to be a permanent feature and which he calls Schiaparelli Vallis. This marking was also observed by Mr. Avigliano, and I have occasionally seen hints of it myself. Baum has also found the south cap to project occasionally above the south limb, an appearance I also find recorded from time to time in my own observations.

The probable nature of the cusp-caps need not concern us here, though it may be remarked in passing that if water is present on Venus there are no physical reasons why they might not be composed of snow and ice despite the greater proximity of Venus to the sun. It is probably true that the mean temperature of the planet is higher than that of the earth, but on the other hand if these caps do mark the poles of rotation then the axis is very nearly perpendicular to the orbit and so the cusp-caps would occupy areas on the disc where direct solar heating would be at its minimum intensity.

One of the more remarkable features of the Venusian scene is the unusual opacity of the atmosphere, and here the cusp-caps occasionally afford some clue to its nature; for often they cannot be distinguished at all and the whole disc appears to be of about the same brightness. Now this can only mean that the atmosphere is not perpetually cloudy, as has been commonly assumed, but that its cloud density varies markedly from time to time. This ties in rather well with a remarkable fact in the history of the elusive markings on the planet, for if anyone will make the investigation he will find apparent periods in which markings were commonly reported to be followed by periods in which few to no markings were to be seen. Again, there will be periods in which the markings appear to have been seen with comparative ease; while at other times they have been extremely difficult, so difficult in fact as to cause many writers to claim that no markings whatever are visible. Just at present we seem to be in an interim period, in which markings are distinguishable but are not well defined.

Comparing this situation to the known history of the earth, there is good geological evidence for marked and periodic variations in the transparency of the terrestrial atmosphere. There is less emphatic but still suggestive evidence for the same sort of thing in relation to the atmosphere of Mars. Lowell's classic work on Mars, for instance, appears to have been done during a period of great transparency in the Martian atmosphere. Such variations would be short-term variations and point to the sun as the probable cause. It is known that an ionized gas tends to become opaque, the degree of opacity depending upon the intensity of the ionizing radiation. Thus on the sun, where this intensity is at maximum, the photosphere looks deceptively solid and furnishes an apparent surface which conceals everything beneath. It seems very likely, Venus being relatively close to the sun, that the more intense ionization of its atmosphere accounts more for its opacity than does ordinary cloud cover. Variations in ionizing radiation received from the sun could be expected to show in variations of transparency of the Venusian atmosphere, and therefore in the visibility of the markings.

This suggests a very interesting line of inquiry for students of the planet. A record should be kept of periods in which the markings are very faint and of periods when they are somewhat easier to see. This record should be compared to the record of solar activity for the same period, as established by reference to the state of the sunspot cycle including the frequency of flares and radio bursts. Should a convincing correlation be found, much of the mystery of the markings would be solved.

Possible variations in the transparency of the Venusian atmosphere, assuming solar-induced ionization as the cause, brings us to one of the best established but least understood of all Venusian phenomena: the ashen light or illumination of the dark hemisphere.

That this is a solar-induced phenomenon is extremely likely. The most convincing explanation is that the night glow is a kind of planetary aurora, not to be confused with the ordinary and highly localized polar aurorae familiar on the earth. R. M. Baum, probably the closest student of the ashen light in our day, specifically recognizes ionization of the upper layers of the planet's atmosphere by solar radiation as the probable cause. Here again is an opportunity to check the correctness of such a view by establishing a record which may be compared to variations in solar activity. Certain it is that the dark side of Venus is not consistently visible, nor can its variations be predicted; but if it can be shown that its periods of visibility correlate unmistakably with periods of unusual solar activity then we would automatically have the explanation for the phenomenon itself.

Direct observation of the markings is not only difficult but commonly produces very different results from different observers, a fact which I believe is related to difference in color sensitivity between various eyes. Moore indeed has found experimental evidence for such a view in experiments with R. M. Baum, J. B. Hutchings, C. D. Reid and himself.

But the most surprising development in recent months has been the report of R. M. Baum on the existence of a web of streak-like markings centered on a dark spot which Baum regards as a sub-solar funnel of rising air. The surprising thing is that Baum's observations so vividly echo those of Percival Lowell, who was the first to describe a virtually identical system. Years after this ghost had been decently laid, it rises again to confound us.

Is this "spoke system" an objective reality? Or is it only an illusion as Moore believes? Personally, I believe that Baum is essentially correct in his delineation; though the system may not be precisely as he pictures it. I have never seen it myself in its entirety; but I have frequently seen isolated streak markings which if integrated would certainly produce an appearance very close to what is seen by Mr. Baum.

In this connection it is noteworthy that before Mr. Baum published his results others had reported radial streaks on the planet, and O. C. Ranck frequently sees them. My own record has a sprinkling of similar observations going back many years. More recently I have received observations from Mr. Charles P. Martens, of Charles City, Iowa; Mr. W. K. Hartmann, of New Kensington, Pa.; Mr. David Meisel of Fairmont, W. Va., Mr. A. Longton, of Lancashire, England; Mr. Brian Warner, of Sussex, England; and Mr. Ranck of Milton, Pa., all of which give support in varying degrees to Mr. Baum's findings. It should be emphasized that the majority of these observations show only fragmentary glimpses of radial streaks, and fall into the category of a mixture of streaks and large, hazy, maria-like spots; but there are also some striking exceptions. An observation taken March 10th, 1956 with a 7-inch mirror, by Mr. Warner, exactly reproduces the appearance noted by Mr. Baum including the central hub; while others of Mr. Warner's observations, running through April, 1956, might have been drawn by Mr. Baum himself. Some of Mr. Ranck's drawings come very close, while scattered examples from the other observers listed above show isolated agreement with Mr. Baum in respect of certain details.

The difficulties attending the observation of the markings may be greatly lessened by employing standard color filters of trustworthy source, such as Eastman Kodak In general I have found blue and green to bring out the markings while red will suppress them; and occasionally I have detected markings in blue or green light which were invisible in integrated light. However, I have also found that the markings do not always respond in the same way to the same filters, affording another bit of evidence for short-term variations in the transparency of the Venusian atmosphere.

A rather unusual phenomenon is the occasional presence of red-sensitive areas on the planet. In integrated light they cannot be distinguished, but in red light they show up as locally brighter spots. Occasionally I have found the entire limb band to be red sensitive, though usually I find it brighter in blue light.

Any hope of using the markings as measures of rotation should be treated with great reserve. While I think it probable that on occasion we do catch veiled glimpses of real surface features, such occasions are so infrequent and the glimpses are so imperfect as to be of little value. The markings commonly observed, including the controversial spoke system, are almost certainly of atmospheric origin and therefore likely to yield very untrustworthy results.

Yet the possibility of measuring the rotation by direct observation is not entirely hopeless. Fortunately there exist several features which lend themselves to measurement.

The most prominent, and the most frequently seen, is a great, shadow-filled notch which occasionally appears just below the south cusp-cap, and which may be termed the South Cusp Cap Indentation. This feature is best observed at dichotomy. Unfortunately it is not consistently visible, but when seen should be observed at least twice on the same date some hours apart. I have thus found some indication of a displacement which would correspond to a rotation near 24 hrs.; but the results are very uncertain and this marking should receive high priority in all Venus observations.

The second feature, seen much less frequently than the South Cusp Cap Indentation, is a system of blackish notches which occasionally shows up at the terminator at about the equator of the disc (which is not necessarily the equator of the planet) and is best observed near Greatest Elongation East. When well seen, these notches strongly suggest the shadows of three parallel mountain systems running N. W. - S.E. Finally we may notice an indentation near the north cusp, much less frequently seen than the southern indentation and apparently smaller.

Insofar as the visibility of any of these features depends upon shadow, you will find a red filter very useful in their examination. In red light true terminator shadows appear much darker than the terminator shading with which they may be confused in integrated light. For the same reason I have found that a red filter will often disclose minute irregularities in the terminator which are quite invisible in integrated light. In blue light, the terminator generally appears very smooth.

In conclusion it seems to me that the most promising areas for future research lie in the directions hereinbefore considered. The task is by no means an easy one, but easy assignments are not apt to bring rich awards. On the other hand each of us, if diligent, has an opportunity to contribute in some measure to the filling in of the many blank spaces on the map of Venusian knowledge.

THE A.L.P.O. AND SATURN

by Thomas Cragg

The Association of Lunar and Planetary Observers (A.L.P.O.) is an organization of amateur astronomers interested in observing the moon and planets. They employ their own instruments chiefly and use others when available. These people enjoy watching the changes on these objects and keep records of such changes. From a series of systematic observations by a number of people, several interesting facts usually turn up. This paper deals with the accomplishments and aims of the A.L.P.O. on the planet Saturn.

Saturn is such an excellent "show" object that one can usually observe it for some time and just drink in the sight; but quite a bit of scientific value can be attained with a little more study. Full disk drawings of what is seen, carefully noting the time, date, and year can be of considerable value when compared with others.

The ball of Saturn exhibits belts like Jupiter, but much fainter. The North and South Equatorial Belts (NEB and SEB) of Jupiter always exhibit dark spots suitable for rotation determination, but not so frequently with Saturn. Small humps on the edges of the belts (both Jupiter and Saturn) are seen and rotation rates can be derived. On Saturn, the "book" rotation rate in latitudes corresponding to the NEB and SEB is $10^h 15^m$. For most of the short-lived spots and humps this rate is borne out fairly well, BUT not necessarily with long enduring spots. Osawa's spot was seen for more than two months and came fairly close to the $10^h 15^m$ rate, but Haas' spot more nearly paralleled the performance of the early STrD of Jupiter -- far from the predicted $10^h 15^m$ rate. In the Equatorial Zone (EZ) the accepted rotation rate is $10^h 14^m$ which was determined from the great white spot of 1933. Subsequent observations of many less long-lived clouds as well as of festoons yield nearly the same rate. As yet, no other disturbance of similar duration has appeared in these latitudes. Observations of another such long-lived cloud would probably be most interesting. In the temperate and polar latitudes only the spectroscopic period is known, but it differs so radically from the tropical regions that visual rates determined from spots would be most welcome.

The intensity of the belts is certainly not the same during various Saturnian seasons. Saturn affords us the best example in the Solar System for determining seasonal effects on belts, since Jupiter virtually has no seasons. Since the seasons are so long on Saturn by our standards, this becomes a long term project. A.L.P.O. observations so far show a seasonal effect, but further confirmation is desirable. It seems the nearer the sub-solar point, the stronger is the belt; but this is still in question.

Faint wispy festoons are seen (mostly between the SEB and EB, and NEB and EB) but are much more difficult than on Jupiter. The very strong preferential direction of the festoons on Jupiter does not seem so "iron-clad" on Saturn.

The shadow of the ball on the ring can be a very good telescopic resolution test, and this shadow always changes sides of the planet at opposition. Similarly, the shadow of the ring on the ball can be used, but doesn't necessarily change over at opposition. The shadow of the ring on the ball, however, has found more use than just a telescopic test. In the early days of the A.L.P.O. considerable attention was given to this shadow as most observers were making it too wide and too prominent over what should have been expected theoretically. After considerable discussion and observation it was agreed by most that the probable explanation was due to the shadow of the Crape Ring! It seems that the shadow of this ring at low inclinations is more prominent than the ring itself! Further confirmation of this is desirable. This was known as the "Ring C Puzzle".

The recent recovery of Ring D was possible confirmation of the solution of the Ring C Puzzle. The shadow of this ring on the ball was observed by many when no shadow was supposed to be visible. Subsequent observations showed the existence of this elusive feature. Now a number of observers have seen Ring D off the ball in the ansae.

The confirmation of a number of those divisions shown by Lowell in earlier times, and by Dollfus at Pic du Midi more recently, by members of the A.L.P.O. is a creditable achievement. The divisions thus far substantiated in the A.L.P.O. are all in agreement with commensurate periods of various Saturnian satellites. The divisions make a good test for resolving power as well as a good training ground for Martian canals. Almost all the divisions are far below Dawes Limit when seen in front of the planet. Identification of minor divisions is just as much a challenge as the canals of Mars, but fewer try the divisions.

The brightness across the various rings has been studied by the A.L.P.O. and variation certainly found, but too few observations exist at present for much of a discussion now.

Some work regarding the brightness of the satellites with respect to orbital position has been done, but too few observations have been made so far. Without photoelectric techniques, the magnitudes of the satellites approach an indeterminate state. At such times as when Saturn is near a known variable star sequence, a concerted effort can be made to get good satellite magnitudes. So far, too few of these observations have been made to say much.

We wish to continue the studies already mentioned and to increase them by more observer participation. The most worthy addition to this study would be micrometric measures of belt latitudes at various ring inclinations. Measures from good original drawings should be helpful, but micrometric measure is preferable.

We are striving to establish a GOOD rotation rate so the Nautical Almanac Office will feel they can publish longitudes of the central meridian of Saturn as they now do for Jupiter.

We wish to get good positions (preferably micrometric) of ring divisions for close determination of commensurate periods. We should like to have evidence good enough to confirm or deny that the divisions all lie close to, but not exactly on, each commensurate period.

Variability of the visibility of divisions with respect to inclination angle is a problem often mentioned but seldom worked on. We hope that by the time the rings close up, we can answer the question. How much of this is due to physical variation in the divisions we hope to know before the rings go edgewise. Chiefly we hope to construct light-curves like Guthnick's, and check if their magnitudes obey the inverse square law exactly.

Readers are cordially invited to join in the work of the Saturn Section.

Note by Editor. The foregoing article, with minor differences, was presented by Mr. Cragg at the National Convention of the Astronomical League in 1956 at Miami, Florida. It is such a good "progress report" of the work and aims of the Saturn Section that we gladly include it in this Tenth Anniversary Issue.

VENDELINUS

by J. D. Bestwick

On the night of 1956, October 21st, I was observing the terminator with my 12-

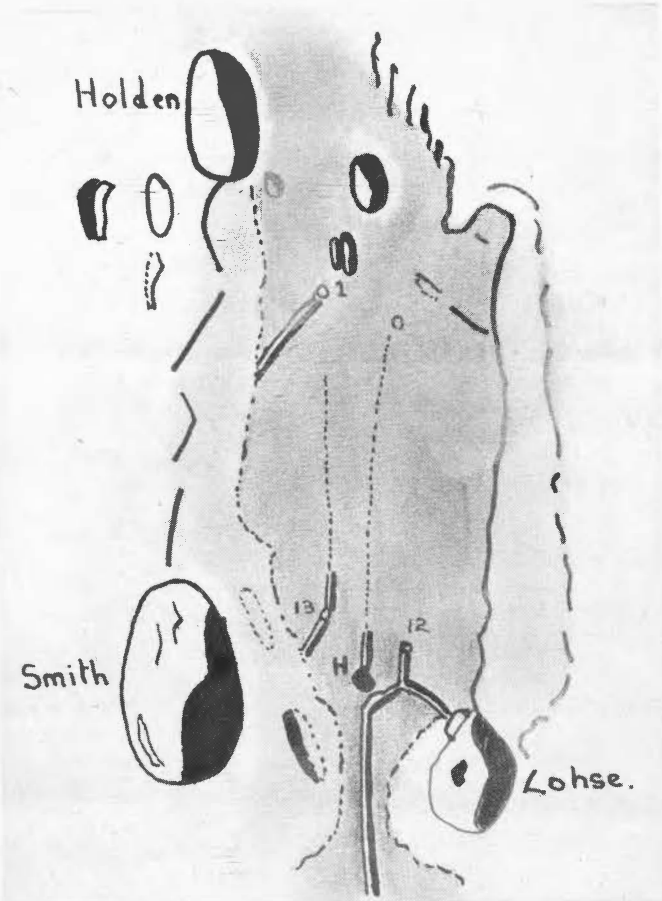
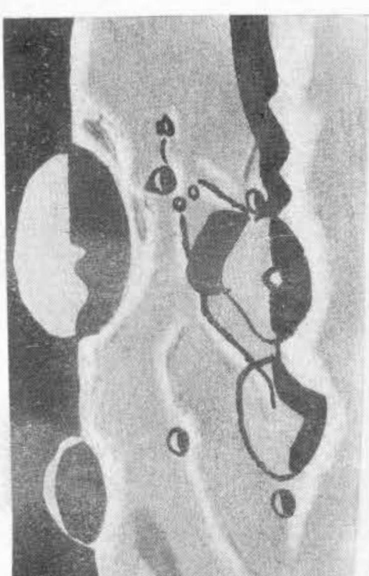


Figure 28. Vendelinus.

J. D. Bestwick.
12-inch Refl. 340X.
Oct. 21, 1956.
Late afternoon lighting.



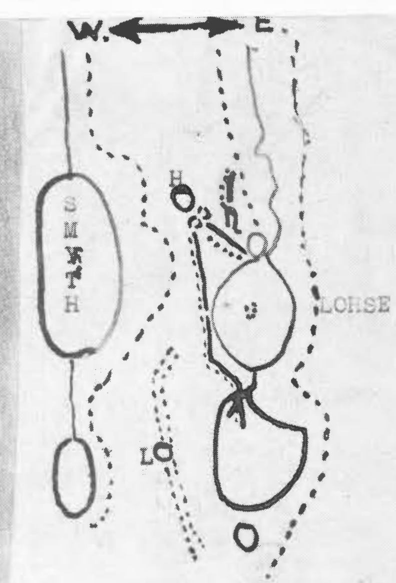


Figure 29.
North Part of Vendelinus.
J. D. Bestwick.
12-inch Refl. 230X.
Jan. 17, 1957. 23^h, U.T.
Colong. = 112°.2.

Figure 30.
Sketch Map of North Part of
Floor of Vendelinus by
J. D. Bestwick.

in. refl. when I noticed that the smooth dark floor of Vendelinus contained some detail. I was using a power of 280X at the time and the moon was just past full. I had read about the supposed cleft but I had never searched for it so I had no idea of its position.

On examining the northern portion of the floor I noticed a broad cleft running from the crater H on my map to the north through the gap in the north wall of Vendelinus. I changed my power to 340X, as seeing conditions were quite good, and then realized that I could see quite an intricate system of fine clefts, in addition to the main cleft seen by Elger.

As the main cleft approached H from the north, it turned suddenly south-east and by-passed H; it was then joined by another cleft from Lohse and continued south to a small craterlet marked 12 by Wilkins. I could not trace it any further. A short cleft, however, was seen running south from the wall of H, but this soon faded out, only a faint streak continuing south.

To the west of H, I saw a thin cleft running from the surrounding of Smith to a minute craterlet, marked 13 by Wilkins; the cleft then continued south for a short distance and faded out, but as before a faint streak was detected running south. Another cleft was seen joining Wilkins' 1 to the wall of Vendelinus.

Finally, I found an extremely fine cleft running from H to the north-west to the wall.

All these clefts were seen quite clearly in moments of almost perfect seeing, and could not, I am certain, be due to ridges or shallow valleys. I have exaggerated all clefts to make them quite clear. Figure 28 shows the detail described above.

It should be mentioned that Vendelinus has given rise to considerable controversy here in the British Isles. Originally, a cleft was seen running continuously from H to L, by Goodacre, Elger and others. More recently however, Wilkins and Barker have disputed the existence of this cleft and it was almost settled that it did not exist. As described above, I have now found this cleft again, but in a different form than did Goodacre, Elger, Wilkins or Barker! I can say no more. I leave readers to draw their own conclusions.

Postscript by Editor. Mr. Bestwick hopes to organize British observers to make a concentrated, coöperative effort to solve these puzzles about the Vendelinus clefts. After all, if we cannot agree about relatively large features in a well-known formation like Vendelinus, we can hardly hope to agree on the small details which are often being "discovered", such as the very controversial O'Neill Bridge. It would be excellent if American lunarians also could make a concerted effort to observe Vendelinus. At Mr. Bestwick's suggestion the Editor lists the following dates on which the solar lighting will be suitable for this purpose in the United States:

Date and Time (U.T.)	Date and Time (E.S.T.)	Approx. Colongitude
1957 Aug. 12, $3^h - 7^h$	1957, Aug. 11, 10 P.M. - Aug. 12, 2 A.M.	$107^\circ - 109^\circ$
Aug. 28, $1^h - 5^h$	Aug. 27, 8 P.M. - 12 P.M.	302 - 304
Sept. 11, $3^h - 7^h$	Sept. 10, 10 P.M. - Sept. 11, 2 A.M.	114 - 116
Sept. 27, $0^h - 4^h$	Sept. 26, 7 - 11 P.M.	307 - 309
Oct. 10, $2^h - 6^h$	Oct. 9, 9 P.M. - Oct. 10, 1 A.M.	107 - 109
Oct. 26, $0^h - 4^h$	Oct. 25, 7 - 11 P.M.	301 - 303
Nov. 9, $4^h - 8^h$	Nov. 8, 11 P.M. - Nov. 9, 3 A.M.	113 - 115

Date and Time (U.T.)	Date and Time (E.S.T.)	Approx. Colongitude
1957 Nov. 24, 23^h - Nov. 25, 3^h	Nov. 24, 6 - 10 P.M.	$305° - 307°$
Dec. 9, $2^h - 6^h$	Dec. 8, 9 P.M. - Dec. 9, 1 A.M.	117 - 119
Dec. 24, 22^h - Dec. 25, 2^h	Dec. 24, 5 - 9 P.M.	310 - 312

Of course, observations outside these time limits will still be very welcome. However, we urge observers to make special efforts to study Vendelinus between the time limits given above so that the coöperative study may be as fruitful as possible.

Mr. Bestwick's address is Iddesleigh, Hartington St., Leek, Staffs., England.

AURORA OBSERVERS WANTED

by Franklin Loehde

In writing this note I feel I am sailing into foreign waters; however, during the International Geophysical Year all the branches of science will unite in an effort to solve the "earthy" problems. One of the "earthy" problems is the study of the Northern Lights. The I. G. Y. program for North America has set up an extensive belt of observers relatively near the zone of maximum auroral frequency in north central Canada. Unfortunately, during great auroral outbursts such as that one of March 1 and 2 of this year, the greatest southern extension is often unobserved, or at least not reported as desired. With solar activity as high as it is (actually higher than at any other time in recorded solar observing history), such displays will occur at more frequent intervals and that is why you are needed for the I. G. Y. period.

In addition to its coöperation with Dr. C. W. Gartlein, Auroral Supervisor for the United States, and Dr. P. M. Millman of the National Research Council of Canada, the Edmonton Centre of the R.A.S.C. has also devised both an elementary and advanced system for recording aurorae. The elementary system would be ideal for southern points as little experience is needed.

Unfortunately in Edmonton (Latitude 53°32') and other northern points twilight is a very serious problem during the summer months, and therefore darker skies farther south may expose an aurora which would otherwise be undetected. Such an observation would be invaluable in filling the gaps of the I. G. Y. program and twilight-stricken stations. The work is very light and is certainly repaid if an auroral display slithers over your horizon.

If you feel you can aid us in any way, by all means send me a line and I will send the simple instructions and forms. Please write to:

Franklin Loehde, 11542 - 65 Street, Edmonton, Alberta, Canada.

VENUS FROM SUPERIOR CONJUNCTION, 1954, THROUGH SUPERIOR CONJUNCTION, 1957

by James C. Bartlett, Jr.

A total of 339 observations were received, of which 74 were made in 1954; 27 in 1955; 237 in 1956; and 1 in 1957. We are much indebted to the following observers for their valuable contributions:

Observer	Place	Instrument
Leonard Abbey, Jr.	Decatur, Georgia	6" reflector
R. M. Adams	Neosho, Mo.	4 1/3" refr.
J. C. Bartlett, Jr.	Baltimore, Md.	3".5 reflector
Ray Berg	Dyer, Ind.	4" reflector
Clive Chapman	Sydney, Australia	8" reflector
Charles Cyrus	Baltimore, Md.	10" reflector
Thomas Cragg	Inglewood, Calif.	6" reflector
W. H. Haas	Las Cruces, N. M.	12".5 reflector
Phil Hackett	Andover, N. Y.	10" reflector
W. K. Hartmann	New Kensington, Pa.	2".4 refractor
Kenneth Hicks	Cleveland, Ohio	6" reflector (?)
Franklin C. Loehde	Edmonton, Canada	12".5 reflector
A. Longton	Preston, England	6" reflector
E. A. Lizotte	Long Island City, N.Y.	6" reflector
Richard McLaughlin	New Kensington, Pa.	4" refractor
Charles Martens	Charles City, Iowa	6" reflector
A. C. Montague	Oak Park, Illinois	4¼" reflector
David Meisel	Fairmont, W. Va.	8" reflector
Richard Miller	Dyer, Ind.	4" reflector
E. M. Paulton	New York, N. Y.	6" reflector
O. C. Ranck	Milton, Pa.	4" refractor
C. J. Smith	Oakland, Calif.	6" refractor
H. P. Squyres	El Monte, Calif.	6" reflector
C. B. Stephenson	New Britain Is.	4" refractor
Frank Vaughn	Madison, Wis.	10" reflector
Brian Warner	Crawley Down, England	7" reflector & 3" refractor
William Weaverling	Dyer, Ind.	6" reflector
J. E. Westfall	Oakland, Calif.	4" refractor
R. A. Wurgel	Union City, N.J.	89mm. reflector

As touching upon the far-flung nature of our efforts, it may be pointed out that when C. B. Stephenson submitted his observations of Venus for the 1954 apparition he was at that time serving with the U.S. Armed Forces in the dismal island of New Britain which lies east of the even more dismal island of New Guinea. The chief attraction of New Britain seems to be hordes of carnivorous insects; which, according to Mr. Stephenson, have no respect for astronomers, military or otherwise. That any observations at all were attempted under such conditions is remarkable; and while the present whereabouts of Mr. Stephenson are unknown to this writer, it is to be hoped that he has found placement in some environment less congenial to six-legged assassins. We may now proceed to details of Venus as observed over the period of time covered by this report.

The Dark Side. The illumination of the night side of Venus for the 1954 apparition was reported by only two observers: O. C. Ranck and the writer. It was first observed by Ranck as early as July 21, at 0^h 40^m U.T., when it appeared darker than the sky. It is to be remarked that on July 21, 1954, the planet was still nearly 70% full, which raises the question of the earliest date following Superior Conjunction on which this phenomenon can be expected. The very earliest date in the writer's personal record is May 13, 1951, which was six months following Superior Conjunction (Nov. 13, 1950), when the value of k was 0.701. It is probable that the limiting earliest date cannot be far from this point. Two things in this connection are important to notice. First, such early visibility dates are rare; secondly, they indicate very considerable variations in the photometric range of the phenomenon, since to be visible so early implies a much greater brightness than would be necessary following greatest elongation east. This is because with a k value of 0.70 and a twilight sky (as in the Ranck observation above), the dark side must compete not only with the solar illumination of our atmosphere but with a 70% solar illumination of Venus itself as viewed from the earth. Incidentally this phenomenon emphasizes the fact that the dark side must at all times be brighter than the sky, notwithstanding that on a bright sky it always appears darker. Relation of sky intensity to the appearance of the dark hemisphere was recently investigated by R. M. Baum.[1]

Following the observation of July 21, 1954, O. C. Ranck recorded the dark side on July 27, July 28, July 29, August 2, August 16, and October 17. On July 28, Haas' phenomenon was observed in the form of a very dark inner lune bounded by a somewhat lighter crescent whose limb was the east limb of the planet (Fig. 31). Ranck's observation of August 2 is remarkable for the fact that only a fraction of the dark side was visible, a narrow lune bordering the terminator (Fig. 32). Again on October 17, though the whole of the dark hemisphere was visible to Ranck and "very plain", the entire dark limb was brighter than the interior regions. Though the Recorder observed Venus on July 27 and 28, two of the dates on which Ranck found the dark side visible, he did not see it until August 6. However, on the two July dates the seeing at Baltimore was down to 1, with transparency on July 28 down to 2. O. C. Ranck on July 27 - 28 enjoyed seeing of 5 and 3 to 4 respectively with transparencies of 3 to 4 and 3 for the two dates. On August 6 this writer found the dark side apparently much darker than the sky and looking "blackish"; but it is significant that it showed well through light, drifting cloud. In other words it was actually quite bright. Ranck did not observe on this date. On August 13, T-5, S-3, the Recorder observed the dark side. In blue light it became very intense, almost blackish but in red light it became invisible. The true color was probably a copper tint, often observed directly. Thereafter this writer did not again observe the dark side until September 23, 1954. Observations had to be discontinued after September 25.

In the morning apparition of 1955, O. C. Ranck was the only observer to report for dates between Inferior Conjunction (Nov. 15, 1954) and Superior Conjunction (Sept. 1, 1955). In two observations made when Venus was in crescent phase, Ranck saw the dark side on January 3, 1955 and again on January 5, 1955. On both dates only a portion of the dark side was visible, a narrow lune adjacent to the terminator (see above, O.C. Ranck, August 2 and October 17, 1954). These two observations by Ranck were the only reports of the dark side received for the 1955 morning apparition.

Following Superior Conjunction, September 1, 1955, the dark side was first reported by the Recorder who saw it April 23, 1956; and again on April 28 and May 1. O. C. Ranck reported the phenomenon for April 25; May 8-14-20-23-24-29; and June 7 and July 29. Charles Martens contributed a single observation of the dark side for May 13; Franklin C. Loehde, for May 7; whilst David Meisel recorded the phenomenon on May 12-14-17-18-26; June 5-7-10-13-29. W. H. Haas made a single observation of the dark side, May 31; a total of 25 observations of the dark side by 6 different observers for the 1956 apparition.

Notwithstanding this comparatively large number of observations satisfactory correlations could not be made. Of the total of 25 observations no less than 10 were singles and so could not be compared; another 11 differed so widely in time of observation between the several observers that observations were not parallel; only 4 of the total of 25 observations could be considered parallel in time, but in each of these 4 examples the observers disagreed completely on the visibility of the dark side. However since transparencies, seeing conditions, and apertures also differed significantly for the 4 parallel observations no conclusive deductions can be drawn from the disagreements.

In this connection it should be recognized that the critical factor affecting the possibility of correlation is not parallelism in time and conditions but the nature of the phenomenon. For example if the phenomenon considered is a major sunspot group, then seeing conditions, aperture, and time may all differ widely as between several observers without affecting the validity of the observations. For such a phenomenon it is a matter of no importance if the aperture is 2 inches or 10 inches, the seeing very poor or excellent. True, the larger aperture and the better conditions will reveal greater detail; but the fact of the phenomenon can be established just as surely by small apertures with poor conditions. No such latitude is allowable, however, for a very delicate phenomenon whose visibility depends not only upon aperture and seeing but equally perhaps upon optical sensitivity of the observer, slight differences in sky background, altitude above the horizon, the power and field of the eyepiece, and so on. Of such nature is the visibility of the dark side of Venus; hence the true parallelism in such observations is almost impossible to establish and apparent disagreements in most cases have no absolute significance.

Notable aspects of the 1956 dark side appearances include color and partial visibility. On April 23, this writer observed the whole of the dark hemisphere evenly illuminated (though appearing darker than the sky). Through a Wratten blue filter the dark side appeared brownish. Through Wratten red the dark limb became so much brighter than the interior as to give the effect of a dark hemisphere too small for the bright.

On April 28, the writer observed the dark side again. The limb was definitely brighter to the eye in white light, while the darker interior up to the terminator had a distinct bluish cast. In green and blue light the dark side became almost invisible; but in red it darkened markedly. Haas' phenomenon was observed by this writer on May 1, when a much darker lune was observed in the dark side (Fig. 33).

A remarkable appearance was recorded by W. H. Haas, May 31. Using Wratten Filter 25, and also the unaided eye, Haas was unable to see the dark side; but with W.F. 58 the dark side was "suspected", while with W.F. 47 the suspicion became "rather definite". Haas also found the appearance of the dark side to suggest a mottling, an effect occasionally noticed by the writer, and also observed that only a portion of the dark side was visible.

O. C. Ranck also recorded a partial visibility of the dark side on April 25, May 8, and May 14. On subsequent dates the whole dark side was visible to him. On May 20, Ranck made three observations at intervals as follows: at $17^h\ 30^m$ when the dark hemisphere was brightened north and south by apparent extensions of the horns (Fig. 34); at $18^h\ 35^m$ when the same effect was observed; and at $19^h\ 55^m$ when these extensions were no longer seen, but the dark limb had become fainter than the interior. Ranck also recorded a fainter dark limb region on May 23, 26, and 29. Ranck recorded the dark side only once after Inferior Conjunction, July 29, when again he saw only a portion of the dark side illuminated extending from the terminator about half way to the dark limb. It is noteworthy that Ranck made many observations past Inferior Conjunction through December 19, 1956; but saw the dark side only once, as noted above, in the morning half of the 1956 apparition.

David Meisel also recorded partial visibility of the dark side. On May 12, 1956, at $0^h\ 65^m$, using an 8" reflector at 210X (but with poor conditions T-1.9, S-2.2), Meisel observed a narrow lune of the dark side, adjacent to the terminator. This looked pinkish through a polaroid filter. Partial visibility of the dark side (always lunes adjacent to the terminator) were also recorded by Meisel on May 17, May 18, and June 5. On May 26, Meisel saw the whole dark hemisphere illuminated with a polaroid filter; but through a red-violet filter it became invisible.

Finally an observation by Charles Martens may be examined. On May 13, 1956, using a 6" reflector at 144X with seeing 3, Martens saw the entire dark side unevenly illuminated with two irregular, brighter sectors (depicted by the dashed lines) north and south (Fig. 35).

To sum up. The dark side appears to have become visible much earlier in the 1954 than in the 1956 apparition; while in both apparitions frequent observations of partial visibility were made.

The Illuminated Atmosphere. This delicate appearance, to be sought close to Inferior Conjunction on either side, was recorded only by O. C. Ranck for the 1954 apparition. On October 17, 1954, Ranck found the dark limb faintly illuminated for its entire circumference. It will be noticed that this was fully 29 days before Inferior Conjunction, so some question may be raised as to the nature of this apparent illumination.

No report of this phenomenon was received for the 1954-55 morning apparition; but in the 1956 apparition O. C. Ranck, on May 24, with a 4" refractor at 120X with a Barlow F2, saw the dark limb "very slightly brighter" than the rest of the dark side. This also was 29 days before Inferior Conjunction (June 22, 1956). Ranck's last observation before Inferior Conjunction was on June 7. On this date he did not observe a brightening of the dark limb, but did observe two narrow, brighter sectors N. and S. which may have been twilight extensions of the cusps. On June 7, 1956, O. C. Ranck observed at $0^h\ 45^m$. On the same date. but at $1^h\ 00^m$ (all times in U.T.) David

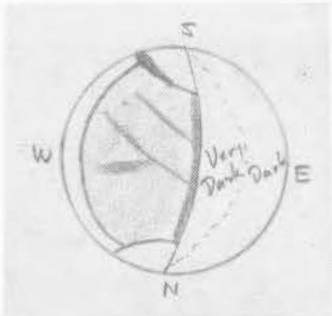


Figure 31. Venus
July 28, 1954. $1^h\ 30^m$, U.T.
4-inch refr. at 180X.
T-3. S-3-4.
O. C. Ranck.

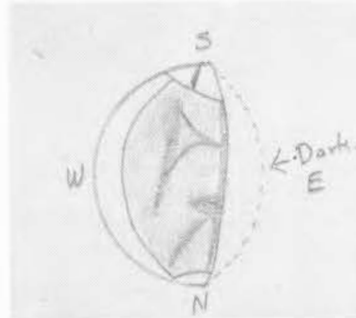


Figure 32. Venus
August 2, 1954. $0^h\ 18^m$, U.T.
4-inch refr. at 120X. T-3. S-4.
O. C. Ranck.

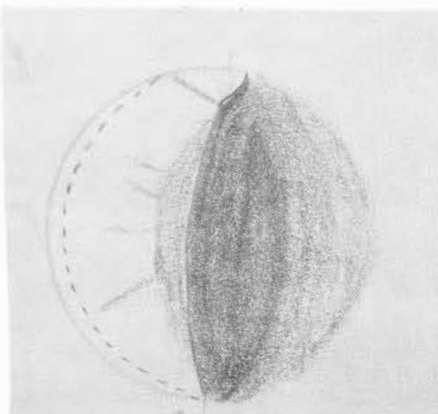


Figure 33. Venus
May 1, 1956. $23^h\ 50^m$, U.T.
3.5-inch refl. at 100X. T-3. S-5.
James C. Bartlett, Jr.

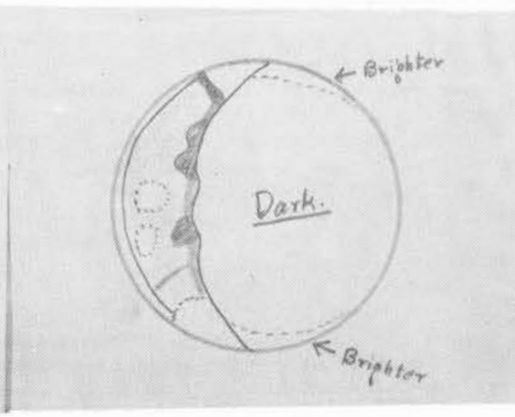


Figure 34. Venus
May 20, 1956. $17^h\ 30^m$, U.T.
4-inch refr. at 120X. T-4. S-4-6
O. C. Ranck.

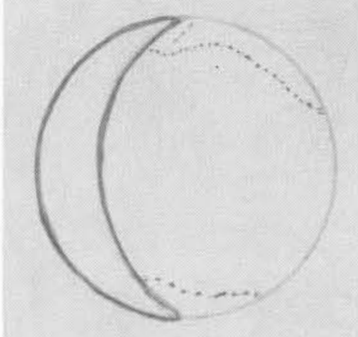


Figure 35. Venus
May 13, 1956. $1^h\ 30^m$, U.T.
6-inch refl. at 144X. T-? S-3.
Charles Martens.

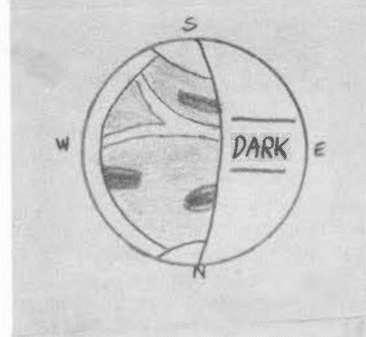


Figure 36. Venus
July 27, 1954. $0^h\ 25^m$, U.T.
4-inch refr. at 180X. T-3-4. S-5
O. C. Ranck.

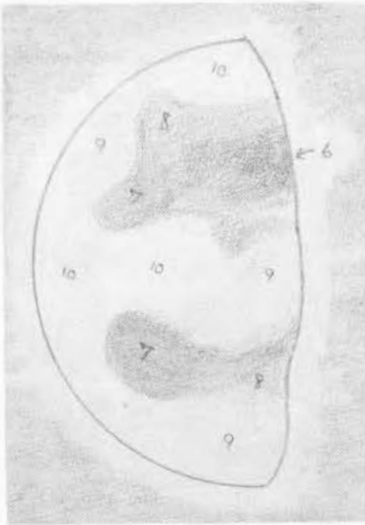


Figure 37. Venus
July 21, 1954. 1^h 35^m, U.T.
6-inch refl. at 288X. T-3. S-5.
Eugene A. Lizotte.

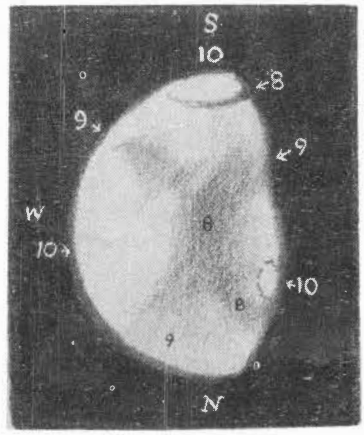


Figure 38. Venus
July 5, 1954. 1^h 30^m, U.T.
6-inch refl. at 96X. T-4. S-8.
Edgar M. Paulton.

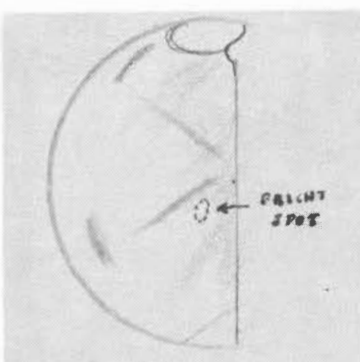


Figure 39. Venus
August 23, 1954. 0^h 10^m, U.T.
3.5-inch refl. at 100X. T-3. S-4.
James C. Bartlett, Jr.

Figure 40. Venus
March 25, 1956. 1^h 20^m, U.T.
6-inch refl. at 141X. T4. S-3-4.
W. H. Haas.

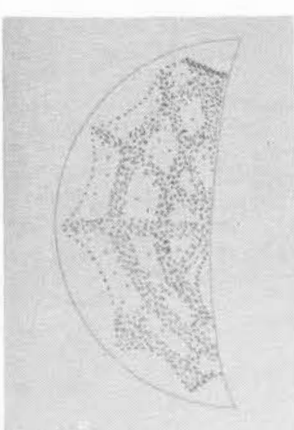


Figure 41. Venus

April 21, 1956.
18^h 15^m, U.T.
7-inch refl. at
230-275X,
T-? S-?
Brian Warner

Figure 42. Venus

March 25, 1956.
0^h 30^m, U.T.
6-inch refl. at
171X. T-? S-6.
Charles Martens.

Meisel observed a twilight on the circumference of the dark limb, using an 8" reflector at 210X. On June 10, Meisel also observed extensive prolongations of both cusps which almost but not quite produced a twilight around the circumference of the dark limb. On June 13, however, 9 days before Inferior Conjunction, Meisel observed what he describes as a "twilight halo" around the whole circumference of the dark limb. Charles Martens, observing June 2, 6, and 8, with a 6" reflector saw nothing of the appearance on those dates.

The Bright Spots. Brighter than average areas on the bright side of the disc were abundantly observed, including a number of observations of what R. M. Baum calls "star points"; i.e. very small, intensely bright spots. These were chiefly observed by O. C. Ranck. Bright bands were also occasionally recorded. These phenomena are perfectly intelligible if we reject the notion that the entire atmosphere of Venus is densely cloud laden. Actually there is no direct evidence for such a supposition, and it seems much more likely that the opacity of the Venusian atmosphere is due to some other cause - probably heavy ionization of the air due to the much greater intensity of the incident solar radiation at the distance of Venus. If so, we might expect individual cloud masses to reveal themselves as bright masses of almost any shape.

In the 1954 evening apparition, O. C. Ranck, observing on July 27 with his 4" refractor at 180X, $0^h\ 25^m$ U.T., depicted a long, forked bright marking sensibly parallel to the apparent equator of the disc, Fig. 36. On August 16, 1954, $0^h\ 15^m$ U.T., Ranck also observed a long, bright band in the apparent north hemisphere. Eugene A. Lizotte, July 21, 1954, $1^h\ 35^m$ U.T., found a broad, 10° bright extension running in from the bright limb about halfway to the terminator (Fig. 37). Edgar M. Paulton, July 5, 1954, $1^h\ 30^m$ U.T., observed a 10° bright spot a little north of the apparent equator (Fig. 38).

In the 1955 apparition observations were received only from O. C. Ranck and W. H. Haas. Ranck, with 4 observations, did not record any bright spots per se. Haas shows a number of small variations in intensity for various parts of the disc (all taken shortly after Superior Conjunction), but contrasts were small.

The writer first saw Venus in 1954 on February 25, or 26 days after Superior Conjunction; but did not observe any discrete bright spots until August 23, 1954, when a small, cloud-like bright spot was observed a little west of the terminator (Fig. 39). A similar spot, of a brilliance superior to either cusp, was observed by the writer on September 4, 1954, at $0^h\ 06^m$ U.T. under somewhat unusual circumstances. At the beginning of observation this spot was intensely bright, a "star point". Examination with Wratten Filters showed it to be much brighter in blue than in green or red. It must have been in process of fading when observation began, for by $1^h\ 15^m$ it had so lost intensity as to have become almost invisible. This variable spot was found just south of the apparent equator and close to the terminator.

During the 1956 apparition bright spots seem to have been much more commonly observed. O. C. Ranck recorded a great number of them, including especially star points. These minute, intensely bright spots were observed by Ranck during 1956 on the following dates: January 18 (not seen earlier); February 12; February 19; February 20; February 26; March 4; March 26; July 29; August 22; September 26; November 5; November 18. They showed no fixed relation to any feature, but occurred at random in all parts of the disc. Altogether Ranck recorded no less than 19 such star points during the 1956 apparition, January through November, of which 10 were in the S. H. and 9 in the N. H. O. C. Ranck was the only observer to report star points for the 1956 apparition, but bright spots in the form of bands, small ovals, ellipses, or irregular shapes were frequently reported by the other observers. Thomas Cragg, Ray Berg, Charles Martens, Frank Vaughn, and the writer all saw brighter than average spots randomly located. A single observation of two small bright spots near the limb was also made by William Weaverling, August 24-25, 1956.

The Dusky Spots. These need not long detain us, the observers showing the usual division between those who see them as large, nebulous, *maria*-like shadings and those who see them mostly as streaks. However, it may be significant, as bearing on variations in the transparency of the planet's atmosphere, that some type of marking was consistently visible to all of the observers.

As touching upon the question of R. M. Baum's observations of the radial markings, the following is of much interest. During both the 1955 and 1956 apparitions, W. H. Haas made a careful series of observations of the markings with a 12"5 reflector, using both the unaided eye and Wratten Filters. Surprisingly, Haas generally found little or no difference in the intensity of the markings with or without filters - which certainly does not conform to the experience of other observers, including this one; but it may be noticed that filters may well be more effective when used with small apertures than with large ones. During the course of his observations, Prof. Haas repeatedly failed to see the radial spoke system depicted by Baum, Lowell, and others. On the other hand on December 11, 1955, using the 12"5 reflector, Haas remarks that "There is a hint here of the radial system of spokes with center at the subsolar point ...." Again on December 24, he felt that such an arrangement was suggested. As a matter of fact, in the view of this writer, all of Haas' drawings for the 1955-56 apparition show something more than a hint. The sketches for November 27-28, December 11, 26, and 28, 1955, all show streak details; chiefly as streaks coming in radially from limb and terminator. The Haas drawings differ from those of Baum in two particulars. In some instances the streaks form parallel systems rather than divergent. In all cases they lack a common meeting point in a dark, subsolar spot. In other instances, however, the streaks <u>are</u> radially displaced from limb and terminator, and if prolonged to meet at a common center <u>would</u> reproduce the radial system of R. M. Baum. In short, our colleague has caught the same, imperfect glimpse of the system which has been seen much the same way by other observers, including the writer.

The problem is complicated by the fact that different eyes will interpret faint linear detail differently, e.g. Antoniadi versus Lowell. Now analysis will show that much the same thing occurs with the streak markings of Venus. O. C. Ranck, for instance, frequently depicts them as thin, sharp lines with rather a Martian look. Thomas Cragg, on the other hand, depicts them as broad and substantial streaks, more like bands. But beneath these superficial differences one may glimpse certain correlations which must be significant.

Consider the drawing by Haas for March 25, 1956 (Fig. 40). The points especially to be observed are not the short, radial streaks coming in from the terminator; but rather the two crescentic bands near the limb. This drawing does not much resemble a typical Baum picture in detail; but it so happens that Baum also shows the dark, crescentic band near the limb which forms part of his spoke system. Let us now turn to a figure by Brian Warner, for April 21, 1956 (Fig. 41). This is simply the Haas sketch with radial streaks added, and with the two bands a little farther from the limb. Let us also look at the drawing by Charles Martens for March 25, 1956 (same date as W. H. Haas above). In the Martens sketch the two thin bands of Haas become one broad one (Fig. 42); but the salient fact is that three different observers, differently equipped, widely separated, and quite independently, agree on the existence of a crescentic dark band or bands near the bright limb. However, they interpret them individually which is to be expected.

It is the same with the streak markings. Compare the figures by Cragg (Fig.43-44). Here again one has marked difference in detail; but agreement in fundamentals - in the existence of radial streaks and of radial streaks which meet at a center.

It seems to me, therefore, that the case for something on Venus which does resemble the system depicted by Lowell and Baum is strengthened by such analogies; but if some such system does exist - and I believe that it does - it is clear that the streaks do <u>not</u> always meet at the subsolar point. In the sketch by Warner (Fig. 41) they meet on the terminator which is far removed from the subsolar point. On April 2, and again on April 6 (Fig. 45), Warner shows the hub of the system which by April 21 had presumably been overtaken by the terminator. O. C. Ranck, Thomas Cragg, and others have also shown a definite hub from which streaks diverge. The existence of such a central spot may therefore be taken as probable, conceding the streaks as probable; but it is clear that its coincidence with the subsolar point, if Cragg, Warner, Ranck, and the writer are correct, is entirely fortuitous when it does occur. In fine, though some such spoke system may well exist on Venus, the theory of its origin is not conformable to many observations.

<u>The Cusp Caps</u>. In the 1953 apparition, the Recorder observed <u>dusky</u> caps on

5 occasions, and O. C. Ranck on 2 occasions parallel in date with two observations by the Recorder. Only one such observation has been reported for the 1954 apparition; an observation by Ranck for August 16, 1954, at $0^h 15^m$, when he found both cusp caps dusky.

During the 1954-56 apparitions the cusp caps remained generally bright to all observers, though variations in intensity were noted. In general, the S. cap was usually the brighter and more prominent of the two, though occasionally both seemed equal and sometimes the N. cap appeared the brighter. On January 15, 1956, O. C. Ranck recorded the N. cap as "very bright" and even "brilliant" and definitely brighter than the S. cap, though not as large.

In the 1955 apparition W. H. Haas observed both caps, complete with dark cusp bands, soon after Superior Conjunction. He found the S. cap larger and somewhat brighter than the N. cap, but not by much. Following Inferior Conjunction in the 1956 apparition, Ranck found the S. cusp dull, the N. cusp bright white on July 18, 1956, at $13^h 30^m$ U.T. On July 29, 1956, Ranck found the S. cusp dusky, the N. cap bright. On September 9, 1956, Ranck also found the S. cusp equal in intensity to the average intensity of the disc; but the N. cap appeared brighter. In this connection Ranck states that for the morning apparition, 1956, the cusps generally appeared brighter to him when the planet was in crescent phase and became duller with approach to Greatest Elongation West. He also found this to be the reverse of the case during the evening half of the 1956 apparition. Ranck also found the S. cusp dusky once more, October 3, 1956.

The S. Cusp Indentation was seen by Paulton, Ranck. Haas and the writer at various times and Ranck also saw it in the morning half of the 1956 apparition, September 9, 1956. Haas, however, questions its existence as a real feature and speculates that the merging of the dark cusp band with the terminator produces a spurious indentation. However it has been well seen when the cusp band was not visible.

O. C. Ranck is the only observer to report apparent structural details in the cusp caps. On July 21, July 29, and August 2, 1954, Ranck drew a dark line across the S. cusp cap (Schiaparelli Vallis?), and again on December 26, 1955. In the 1956 apparition, Ranck drew this feature on January 15; January 18; February 5; and again on March 4. In the March 4th observation the streak is part of a long streak reaching to the limb in the N. H. In a single observation, April 1, 1956, Ranck drew a prominent dark streak cutting across the N. cap and running N. to S.

<u>Terminator</u>. In the 1954 apparition terminator irregularities were observed by Edgar M. Paulton, Eugene A. Lizotte, and the writer. Reports for the 1955 morning apparition were too few, and in any case no irregularities were reported for the morning terminator; but in 1956 irregularities were reported by O. C. Ranck, A. Longton, Charles Martens, Brian Warner, and the writer. They took the general form of indentations at both cusps, uneven curve, or slight irregularities suggesting shadows. W. H. Haas, however, questions whether such effects are real or are to be referred to contrast effects at the terminator. The Recorder is of the opinion that some at least must be referred to real features.

O. C. Ranck is the only observer to report bright projections at the terminator, apparently clouds. On February 8, 1956, Ranck showed a "bright hump" on the terminator extending into the dark side, and on February 12 two such features. On February 26, Ranck also observed such a projection onto the dark side; but thereafter saw none until April 1, 1956, when he found a small bright spot lying about equally on bright and dark side of the terminator. He next reported bright bulges on the terminator of the morning crescent, July 18, 1956; August 25, 1956; September 18, 1956; and October 3, 1956. All occurred at random positions.

In the 1954 apparition Greatest Elongation East occurred on September 6 at 6^h U.T. The terminator appeared straight to this writer as early as August 15, 1954, or some three weeks before theoretical dichotomy. On August 17, the terminator appeared convex; but again straight on August 22 and 23. On September 5, a day before elongation, the terminator appeared very slightly concave as it did also on the 6th. However, to John E. Westfall, the terminator appeared slightly convex on August 21 and August 31, 1954; but straight on September 4, 5, and 6. Two sketches by C. B. Stephenson, for September 10 and September 13, 1954, show such a slight degree of concavity that the terminator (save at both cusps) might be considered straight. Leonard B. Abbey shows an irregular terminator for September 1, 1954, but on the whole straight; and a definite concavity on September 5, which agrees with the writer's observation of that date but is in disagreement with Westfall.

No data are available for the 1955 apparition (morning). In 1956, Greatest Elongation East occurred on April 12 at 18^h U.T. The terminator appeared sensibly straight to the Recorder on April 4, 1956, April 5, and April 9. On April 21, 9 days after theoretical dichotomy, the terminator appeared still straight in integrated light and in blue light, but sensibly concave in red light. On April 23 it appeared definitely concave in integrated light. O. C. Ranck made no observations between April 1 and April 9; but on the latter date he remarked that the terminator seemed slightly concave, but questionable due to poor seeing. Brian Warner shows a straight terminator as early as April 2, and as late as April 15, though both cusps projected on that date. Longton also shows a sensibly straight terminator for April 2, though rendered somewhat doubtful by irregularities. A straight terminator is also shown for April 7 by Chester J. Smith. W. K. Hartmann depicts a very slight convexity on April 2, and Charles Martens thought it very slightly convex on April 6.

It is evident that many factors - seeing, the proximity of dusky markings, the depth of the terminator shading, and individual visual acuity, all seriously affect the estimates of apparent dichotomy. It is also highly likely that the intensity of the sky background is a critical factor.

In this, as in so many Venusian features, correlation becomes extremely difficult and we must perforce be content with approximations.

Reference

1. Baum, R.M.; A Preliminary Note on the Photometry of the Dark or Night Hemisphere of the Planet Venus; The Strolling Astronomer; January-February, 1956; p.11.

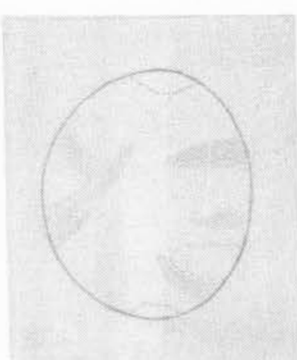


Figure 43. Venus

January 30, 1956.
$1^h\ 45^m$, U.T.
6-inch refl. at 104X.
T-4. S-3.
Thomas Cragg.

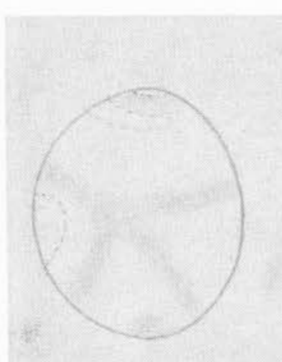


Figure 44. Venus

January 29, 1956.
$1^h\ 55^m$, U.T.
6-inch refl. at 104X.
T-4.5. S-3.
Thomas Cragg.

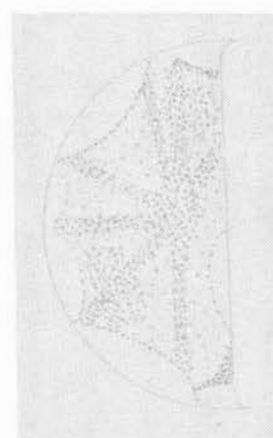


Figure 45. Venus

April 6, 1956.
$18^h\ 12^m$, U.T.
7-inch refl. at 230-275X.
T-? S-?
Brian Warner

SOME PHOTOGRAPHIC EVIDENCE FOR

AN APPARENT LUNAR SURFACE OBSCURATION

The attention of all serious students of the moon is earnestly directed to an article "A Suspected Partial Obscuration of the Floor of Alphonsus" on pg. 158 of Publications of the Astronomical Society of the Pacific for April,1957 (Vol. 69, No. 407). The author is Dr. Dinsmore Alter, the Director of the Griffith Observatory and Planetarium in Los Angeles. Since April, 1954, Dr. Alter has been engaged upon a photographic study of the moon with the Mount Wilson 60-inch reflector. Plates are taken in pairs, a blue-violet photograph and an infrared one being quickly alternated. Any lunar atmospheric effects should cause much greater scattering in blue-violet than in infrared so that the detail thus veiled would be fainter and more difficult on the blue-violet photographs. Such effects would be most noticeable, Dr. Alter points out, under very low solar lighting because although the possible lunar atmospheric scattering varies little with the altitude of the sun, the lighting of a crater floor decreases very rapidly with the approach of the sun to the horizon.

Four pairs of plates were secured under unusually favorable atmospheric conditions on October 26, 1956 between $12^h\ 0^m$ and $13^h\ 16^m$, U.T. colong.= $177.^{\circ}0 - 177.^{\circ}6$. Two of these pairs are reproduced here as Figures 46 to 49. Careful comparison should be made between Figure 46 (blue-violet) and 47 (infrared) and also between Figure 48 (blue-violet) and 49 (infrared). We attempt to publish here only those parts of the original plates which show the floors of the craters Alphonsus and Arzachel. Alphonsus is the left and larger of the two. Attention should be especially directed to the west (upper) sections of the two floors. To quote from Dr. Alter's article:
"In each of these craters the infrared reveals a rill in the western side of the floor . . . . . In Arzachel this rill shows plainly in all eight photographs. In the crater Alphonsus the result is different. There each blue photograph shows much less detail than can be seen in its infrared mate . . . . For some reason the blue-violet photographs lose more detail in the west side of the floor of Alphonsus than they do in the floor of Arzachel. This is not true of the infrared ones."

The most obvious interpretation of such an anomaly is certainly some kind of lunar atmospheric obscuration. With commendable conservatism, however, Dr. Alter also suggests several other possibilities and concludes only that this lunar area merits a more intense search when near the terminator. This conclusion we can only most heartily endorse.

Lunar visual observers, including some of considerable skill and experience, have frequently reported apparent temporary obscurations of familiar details. Never before, however, to the Editor's knowledge, has anyone produced photographic evidence of such effects. It is hardly necessary to say that more photographic evidence of this kind would be a most valuable contribution to lunar science, and perhaps a few of our best-equipped members would like to undertake such an investigation. The floor of Plato would appear to be a splendid subject for such a study, bearing in mind the numerous reports by eminent visual observers of low-sun apparent obscurations of the floor craterlets.

We express our thanks to Dr. Alter and to the Astronomical Society of the Pacific for their coöperation in making this article possible, including the use of the accompanying photographs.

BOOK REVIEWS

The Sun, by Giorgio Abetti. Macmillan Co., N. Y. English translation. 336 pages. Illustrated. $12.00

Reviewed by Victor W. Killick

At Florence, Italy, once the home of Galileo, first to turn a telescope on the Sun, is a modern well equipped solar tower located on the ground of the Arcetri Observatory where Prof. Giorgio Abetti has made many important astronomical contributions. Chiefly his researches have been in the field of spectroscopic

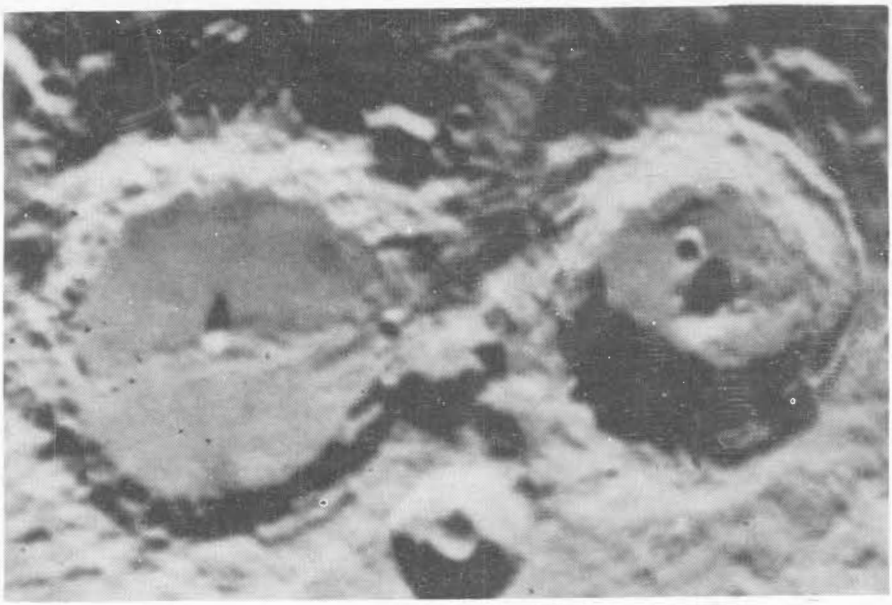


Figure 46.
Photograph by Dinsmore Alter with Mt. Wilson 60-inch Reflector of Alphonsus-Arzachel Region on Moon. Blue - Violet, Kodak Spectroscopic Plate II - O. October 26, 1956, $12^h\ 0^m$, U.T. Colong. 177°.0. Exposure $0^s.25$. Development for Five Minutes in D 19. Lunar South at Right, West at Top.

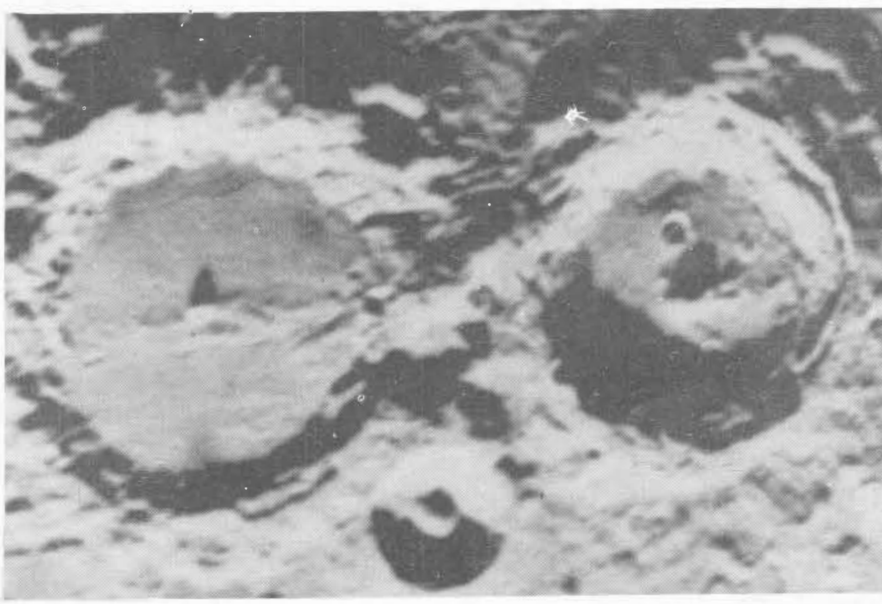


Figure 47.
Photograph by Dinsmore Alter with Mt. Wilson 60-inch Reflector of Alphonsus-Arzachel Region on Moon. Infrared, Kodak Spectroscopic Plate I - N. October 26, 1956, $12^h\ 2^m$, U.T. Colong. 177°.0. Exposure $1^s.20$. Development for Five Minutes in D 19. Lunar South at Right, West at Top.

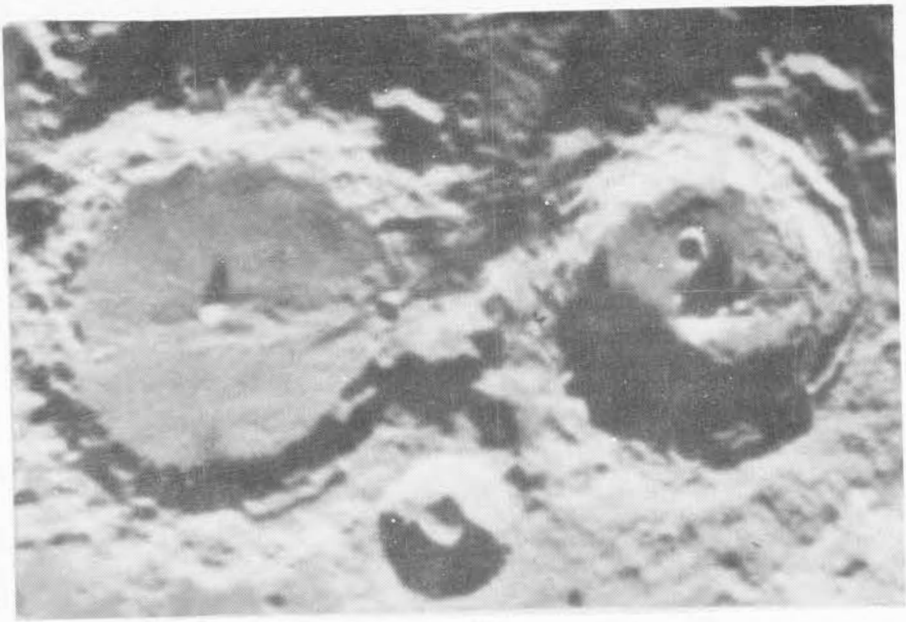


Figure 48.
Photograph by Dinsmore Alter with Mt. Wilson 60-inch Reflector of Alphonsus-Arzachel Region on Moon. Blue-Violet. October 26, 1956, 13^h 14^m, U.T. Colong. 177°.6. Other Data as in Figure 46.

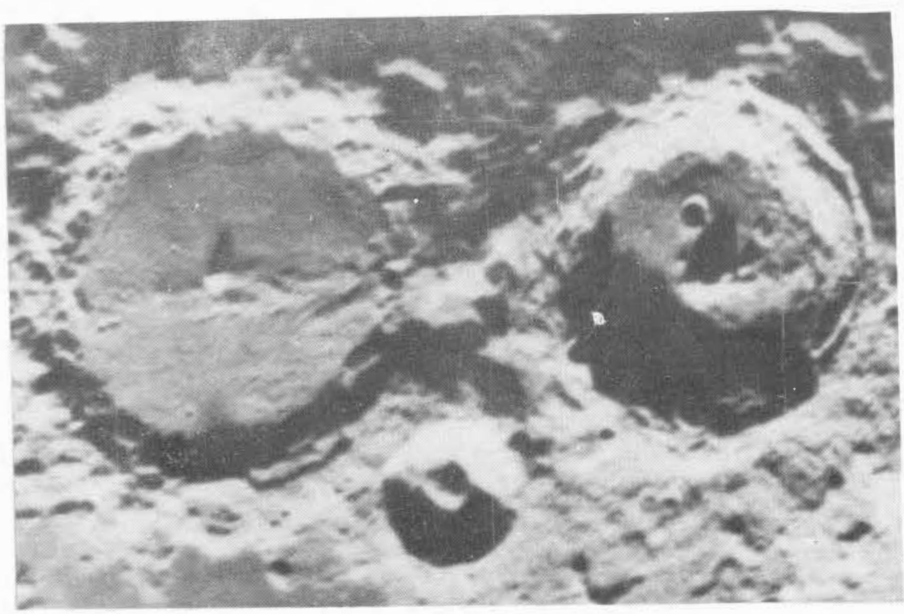


Figure 49.
Photograph by Dinsmore Alter with Mt. Wilson 60-inch Reflector of Alphonsus-Arzachel Region on Moon. Infrared. October 26, 1956, 13^h 16^m, U.T. Colong. 177°.6. Other Data as in Figure 47.

observations of sunlight.

He began writing about it in 1934. His first book was translated into several languages and found instant acceptance from both professional and amateur astronomers. Rapid growth of new facts concerning the Sun necessitated two later editions of the work, one in 1951 and the present edition released in the United States a few months ago.

In the latest edition the author has brought together within the covers of a single volume a complete historical summary of just about all the facts known concerning the Sun up to this time. Abetti's personal contributions to the subject are thoroughly covered and contain much information not easy for a layman to find elsewhere. The book is well documented with references, completely indexed and amply illustrated. It has been excellently translated into clear, concise English and is wonderfully well organized to facilitate looking up any part of the subject matter quickly.

* * * * * *

Light, Vegetation, and Chlorophyll, by J. Terrien, G. Truffaut and J. Carles. Philosophical Library, New York, 1957. 228 pages. $6.00

Reviewed by W. Ellis Watkins

A translation of two books from the French by Madge E. Thompson. This book would have a special interest not only for the plant scientist but also for those in related fields who are interested in using physics, chemistry, and other sciences as tools to explain the world about us. The authors have done a masterful piece of work in describing the part light, both visible and invisible, plays in the photosynthesis, transpiration, and other processes of the plant. Chlorophyll is described as a very important agent between light and photosynthesis, but many of the light waves, including the invisible, may influence a plant to grow in an orderly and balanced manner.

The authors have inserted many bits of pertinent information and data, which make the reader feel that he has discovered a rare treasure in this book. They have done well in making a difficult subject largely understandable to the public without popularizing or cheapening it. These authors have reviewed critically many experiments and seem to be interested in only scientifically sound, carefully prepared, and conducted experiments.

* * * * * *

Der Sternenhimmel 1957, edited by Robert A. Naef. Verlag H. R. Sauerländer and Co., Aarau, Switzerland, 1957. 122 pages. . . . . . Fr. 6.95.

Reviewed by William E. Shawcross

Perhaps one of the greatest lacks in American astronomical literature for the amateur is an adequate observer's handbook. We must, therefore, rely on the Canadian Observer's Handbook and the Handbook of the British Astronomical Association. Der Sternenhimmel is another handbook of this nature, and only its two shortcomings - it is written in German and, where time and place are of consequence, the reference is to Switzerland - keep it from being widely used in this country, for it has a great many features not found in the other handbooks mentioned.

Among these features special attention is called to the many drawings which aid in understanding the phenomena treated; for example the phases, elongations, and transits of Mercury, solar and lunar eclipses, the occultation of Saturn by the moon which occurs in late September, 1957, conjunctions, and rotation of the sun. The many photographs of the objects discussed add to the enjoyment of the reader, as well as to the enlightenment of the novice in astronomy. An Astro-Kalendar for each month is given - a day-by-day listing that covers all sorts of heavenly events. A star chart is part of each Kalendar, showing the sky for that month as seen from Switzerland or any other place of approximately the same latitude. Treatments of the rings of Saturn, minor planets, periodic comets, variable stars (with comparison star charts for Algol, delta, mu, T, VV Cephei, and W Cygni) are included. Planetary coördinates are tabulated for the portions of the year when the planets are visible; also coördinates for the moon. Miscellaneous lists and short articles round out The Starry Sky 1957.

For those who read German, this book is highly recommended. Probably you will not be able to get the 1957 edition in time to put it much use; however, now would be a good time to order the 1958 edition. American readers can purchase Der Sternenhimmel from Albert J. Phiebig, P.O. Box 352, White Plains, New York.

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A Key to the Stars, by R. van der Riet Woolley, Astronomer Royal. Third Edition. Philosophical Library, New York, 1957. 144 pages. $4.75

Reviewed by Charles A. Haas

This book is written for people who are interested in the subject of astronomy and treats the subject in simple terms, avoiding mathematical and physical technicalities. The First Edition appeared twenty years ago, and the mere fact of a Third Edition shows the value of the book to the people in astronomy.

The book is divided into seven chapters. Each chapter develops a topic from the beginning of astronomical records to the present time. Three pages of star maps show the main constellations for each month and the bright stars. The author gives a very simple and most interesting discussion of the measurement of stellar distances and of the composition of the stars.

The last chapter is devoted to some of the astronomical observatories, stressing the importance of refractors and reflectors in their various uses. The last paragraph is thought-provoking.

The reviewer greatly enjoyed this little book.

* * * * * *

The Report on Unidentified Flying Objects, by Edward J. Ruppelt. Doubleday and Co., Garden City, New York, 1956. 315 pages. $4.50

Reviewed by Walter H. Haas

Captain Ruppelt, as many of our readers will know, was in charge of the U.S. Air Force's Project Blue Book, investigating all reports on "flying saucers" from 1951 to 1953. This book certainly lives up to its title; for there are a huge number of detailed reports on unusual, mystifying, and seemingly inexplicable aerial objects. In the book, as in his official capacity with Project Blue Book, the author refuses to choose sides; and one does not know whether he thinks that all "unidentified flying objects" can be naturally explained when there is enough information from sufficiently careful observers or whether he regards some of the "unknowns" as manned spaceships from other worlds. One may suspect the latter.

An interesting byproduct of reading the book is some insight into the workings of military organizations. We are told by the author that the political winds have been now very harsh, now very cozy, for "flying saucers"; and with changing official policy remarkably contradictory publicity releases have been given out - as we all know.

What must certainly be accepted is that a large number of competent witnesses have seen objects which they have been unable to identify. In many cases these witnesses have been familiar with ordinary astronomical phenomena and with both conventional and experimental aircraft. The explanation of the sightings is something else again; and since the hypothesis of interplanetary spaceships will explain anything and everything, it is incumbent upon us as scientists to investigate all other possibilities thoroughly before rejecting them. The evidence to date in favor of an interplanetary origin is wholly circumstantial and thus all inconclusive, in the opinion of a panel of scientists chosen to evaluate Blue Book's findings. For example, there are apparently still no really reliable positions, velocities, and sizes for a single sighting, in spite of several ambitious plans in this direction reported by the author.

This book is very well written and will be rewarding to all persons with any interest in this subject.

SEARCH FOR SMALL SATELLITES OF THE MOON DURING THE TOTAL LUNAR ECLIPSE OF NOVEMBER 18, 1956

by Clyde W. Tombaugh

There is no way of knowing how many visual searches for satellites of the moon have been attempted. Some observers do not report such efforts when results are negative. Others may have felt that their efforts were too sporadic. However, the methods of visual searching must be extremely limited - either in sky area, or in stellar magnitude because of the large number of stars that must be checked for satellite motion, which is the only feasible criterion of identity.

The best strategy is to photograph the sky area around the moon during a lunar total eclipse. Since the moon can gravitationally hold a satellite out to a distance of about 37,000 miles according to W. H. Pickering, equal to 9 degrees, a wide-field camera is a necessity. The relatively short time of totality (seldom much over an hour) does not permit taking photographs at various rates of driving to reduce dilution effects from trailing. It is better to guide the instrument on some bright crater-spot on the moon so as to favor the elongation sectors for all luni-centric distances.

The reader is referred to pages 7 - 11 of the January-February, 1956, issue of The Strolling Astronomer, Vol. 10, Numbers 1 and 2, in which Mr. Baum has an informative article, "A Meteoritic Satellite to the Moon". Of particular interest is an account of the earlier search attempts. Apparently, Barnard's search at the Lick Observatory with a 6-inch Willard lens during the total lunar eclipse on September 3, 1895 was the most exhaustive one prior to the November, 1956 eclipse. E. C. Pickering's search in 1888 extended to the 10th magnitude, and Barnard's in 1895 extended to the 12th magnitude. Since the telescope was manually guided on the moon (at least for the latter) the plates would have favored the "greatest-elongation" sector on each side of the moon where the motion of any satellites would be in the line of sight and thus yield point images. The other sectors would have inevitably been subjected to dilution losses from appreciable trailing. Not knowing Barnard's plate speed nor the focal ratio of his instrument, I am uncertain as to which sectors the 12th magnitude limit applies.

Since the umbral shadow is scarcely $1\frac{1}{2}$ degrees across, and the penumbral extends to only one half degree beyond the umbra, a search for satellites in full illumination by the sun can be made to within about 2500 miles of the moon's surface when the moon is near the edge of the umbra and allowing for several minutes of time exposure. It is even worthwhile to search to within 1000 miles of the moon's surface where the partial solar illumination would amount to 50 per cent at beginning and ending of totality. The probability of a lunar satellite lying within the Earth's shadow during lunar eclipse decreases with increasing luni-centric distance.

Messrs. C. W. Tombaugh, B. A. Smith and C. F. Capen, Jr. made a special trip from Las Cruces, New Mexico, to Flagstaff, Arizona to take photographs of the sky area around the moon during the total lunar eclipse on November 18, 1956. Through the kind permission of the Lowell Observatory, three of their most suitable instruments were used, namely: (1) the 13-inch Lawrence Lowell Telescope f 5.2, (which I used in finding Pluto in 1930) (2) the 5-inch Cogshall camera, f 4.5, and (3) the $8\frac{1}{2}$ - $12\frac{1}{2}$ inch Lower Schmidt, f 1.6.

Prior to the eclipse, Smith borrowed certain equipment from New Mexico College of A. and M. A. to assemble a very sensitive sky photometer which he attached to a portable 5-inch reflecting telescope. One morning a few days before the eclipse, this apparatus was calibrated for "saturation" exposure with Eastman 103a-O test plates taken with the 13-inch and 5-inch instruments on the Praesepe cluster.

The evening of the eclipse was cloudy to within one hour of totality. With the hope that the clouds would disperse in time to observe totality, the plate-holders were loaded and the telescopes were made ready. Thanks to a clouded Earth's periphery, the usual reddish light was almost completely blocked off, causing a "dark eclipse" and a very dark sky, sufficient to prolong exposures to one magnitude fainter than usual.

The eclipse was almost too dark, for during the second plate exposure, Proclus near the west limb became so faint that Mr. Smith was able to guide on it only with extreme difficulty. During the third and fourth plate exposures, guiding was shifted to the brightest crater-spot near the east limb, Aristarchus, which by that time had emerged out of the darkest part of the umbra.

The photographs turned out to be of excellent quality. Tombaugh and Smith obtained three 14 x 17 inch plates with the 13-inch and four 8 x 10 inch plates with the 5-inch Cogshall camera. Capen obtained 18 films with the Schmidt in another dome nearby. Because of the fast focal ratio of the latter, the longest exposures were limited to two minutes, and reached into the 14th magnitude for point images. The plates taken with the 5-inch Cogshall camera reached to magnitude $15\frac{1}{2}$, and each plate covered almost the entire sky area in which the moon could hold a satellite. The 13-inch reached to magnitude $17\frac{1}{2}$ for point images, but the greater scale limited the field to six degrees on each side of the moon.

Point images of any possible lunar satellites would be obtained in the greatest-elongation sector on each side of the moon for all luni-centric distances. The plates taken with the 13-inch cover a luni-centric distance of 24,000 miles to each side of the moon. But, there is some loss in magnitude near the edges of the plates, so that the most effective reach, namely magnitude $17\frac{1}{2}$, extends to about 20,000 miles. The point image sectors are only 3 degrees wide, or a total of 6 degrees out of the 360 degree circumference. Thus only a small amount of satellite space was explored to the faintest limit capable of detecting a satellite 15 feet in diameter with an albedo of 7 per cent. The 5-inch Cogshall camera plates cover 20 degrees of the circumference without trailing loss to its limiting magnitude, namely $15\frac{1}{2}$. When one computes and plots the trailing losses, each magnitude contour sector takes on a form resembling that of the German Cross; the lesser luni-centric distances are not so wide because of more rapid revolutionary motion. The sectors in front of and behind the moon are the worst because the motion would be broadside to our view and would amount to 4 and 5 magnitudes loss for the 5-inch and 13-inch instruments, respectively. Thus, the magnitude limits are 11 and 12, respectively. Fortunately, these do not extend very far to each side of the penumbral shadow and vanish altogether at 15,000 and 20,000 miles, respectively. The next worst sectors occupy over half the volume of satellite space, in which the limit of detectable satellites is magnitude 12 and 13 for the 5-inch and 13-inch plates, respectively. It is interesting to note that the 13-inch plates were one magnitude ahead of the 5-inch, in spite of the 13-inch scale being nearly 3 times greater and hence three times more sensitive to trailing. It should be remembered that trailing is essentially one-dimensional, whereas aperture area increases as the square. Luckily, the 5-inch plates covered the sectors to magnitude 13 which lay beyond the edge of the 13-inch plates. Thus, practically all of lunar satellite space, except for the relatively small sectors in front of and behind the moon, was explored down to the 13th magnitude, which means a diameter for possible satellites of 100 feet, if the albedo is assumed to be 7 per cent. Sectors nearer "greatest-elongation" were explored to progressively fainter limits - from 100 to 15 feet diameter, depending on the trailing loss which decreases toward greatest-elongation.

One always runs into a host of spurious suspects near the threshold limit of photographs. Over 500 lunar satellite suspects were marked, and much painstaking work was required to check them against the other plates. No "off-set" technique was used with the eclipse photographs because it seemed better to reach to a fainter magnitude instead of dividing the light into two images, since there were several plates to check each suspect. To date, <u>no</u> lunar satellite suspects have been satisfactorily confirmed.

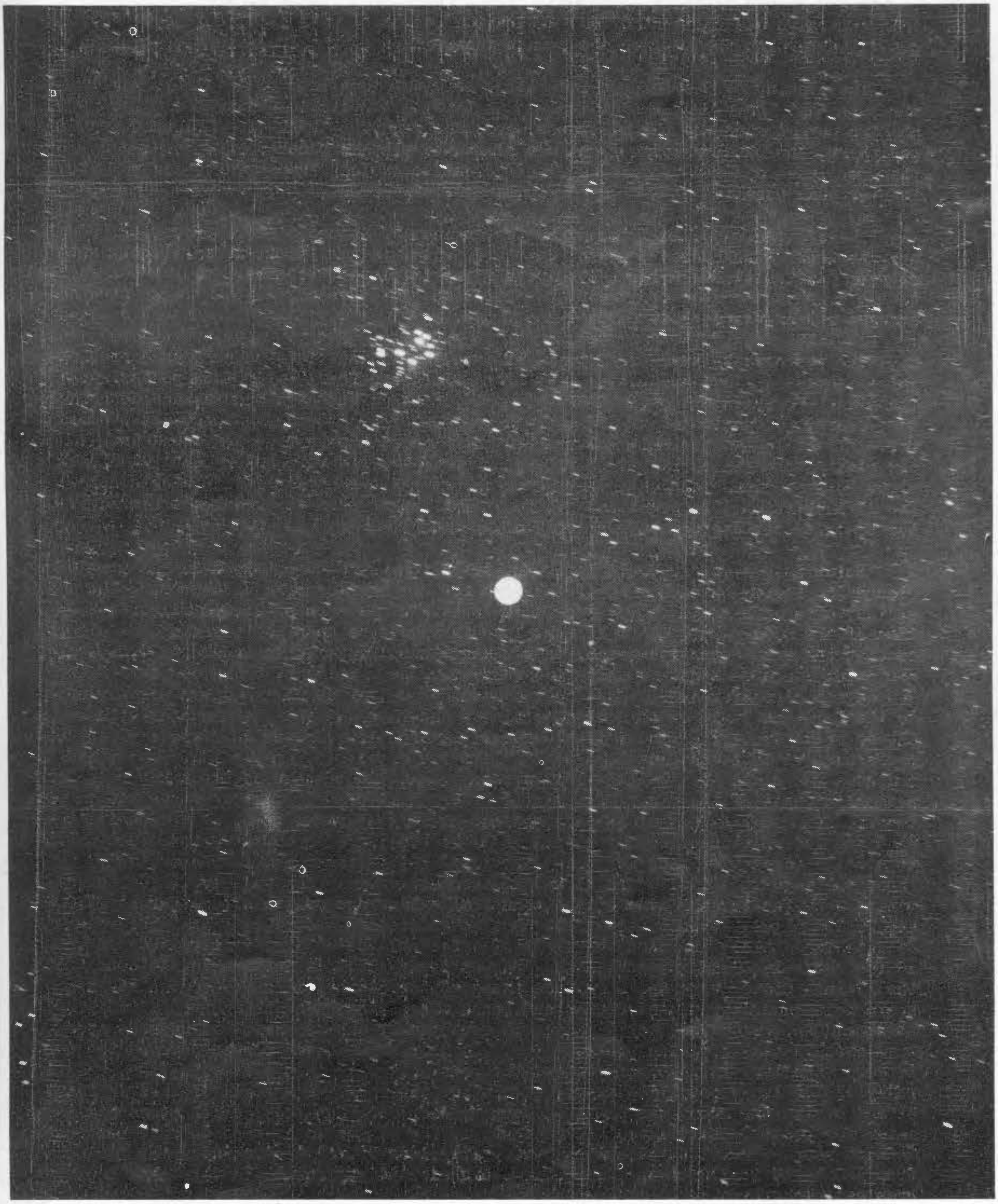

Figure 50.
Portion of the Second 8 x 10 Plate Taken with the Lowell Observatory 5-Inch Cogshall Camera during the Total Lunar Eclipse on November 18, 1956, Exposure Time 15 Minutes. Note the Pleiades a Few Degrees North of the Moon.
Refer to Text in Article by Clyde W. Tombaugh in This Issue.

Thus, a very substantial gain has been made in the search for lunar satellites. But, a greater photographic gain could be made with a large, fast focal-ratio Schmidt telescope during total eclipses of the moon in the future. Several repeated attempts will be necessary to eliminate the possibility of lunar satellites lying within the Earth's shadow cone during eclipse events.

The opportunity exists for visual searches around first and third quarter phases of the moon, when one may look for moving points of light just beyond the moon's terminator. At such times, the moon is not flooding the sky with light too badly, yet the solar illumination on a possible satellite is sufficient to bring it within 2 stellar magnitudes of the maximum possible brightness. In observing, the sunlit portion of the moon should of course, be displaced from the actual field of view. There are possibilities with a 12-inch aperture out to a luni-centric distance of 3,000 miles, where the broadside motion would range from 55 to 30 seconds of arc per minute. But for luni-centric distances greater than 3,000 miles, a 24-inch would be required to beat the photographic limit to date; and the broadside motion would range from 30 to 10 seconds of arc per minute. Although, the latter is too slow to detect readily, any star-like object seen against the dark background of the unilluminated moon should exhibit an appreciable shift in a minute's time. The relatively slow motions of possible lunar satellites would help to distinguish such bodies from lunar meteors. One should be on the lookout for possible retrograde motions, also.

It would be hopeless to conduct such a visual search beyond the edge of the moon over areas greater than a one degree patch because of the great number of faint stars.

If anyone should conduct such visual searching, the time and circumstances (both instrumental and meteorological) should be reported to the author in order to assess a statistical coverage at this address: 636 S. Alameda Blvd., Las Cruces, New Mexico.

The existence of such objects may be negative, but we need the assurance of observational evidence because it involves the safety of moon rockets in the near future and it could prevent mis-identification in following them in their trajectories, or orbits.

The above described search for lunar satellites was supported by the Office of Ordnance Research of the U. S. Army, as a portion of a larger project to ascertain the content of satellite space.

THE TOTAL LUNAR ECLIPSE ON NOVEMBER 18, 1956

by Walter H. Haas

Introduction. Let us first remind ourselves of the circumstances of this eclipse:

Moon enters penumbra ... 1956, Nov. 18,	$4^h\ 0^m$, U.T.
Moon enters umbra	$5^h\ 3^m$, U.T.
Total eclipse begins	$6^h\ 8^m$, U.T.
Middle of eclipse	$6^h\ 48^m$, U.T.
Total eclipse ends	$7^h\ 27^m$, U.T.
Moon leaves umbra	$8^h\ 33^m$, U.T.
Moon leaves penumbra	$9^h\ 35^m$, U.T.

It will be noted that the eclipse was fairly long, totality lasting for 1 hr., 19 mins. and that it occurred with the moon high in the sky in the United States.

Visibility of Penumbra. Mr. Franklin Kosdon of Buttonwillow, Calif. found the penumbral shadow easily visible in a 10-inch reflector at $4^h\ 43^m$, U.T. J. Russell Smith of Eagle Pass, Texas photographed a distinct penumbral darkening at $4^h\ 25^m$ with an 8-inch reflector and suspected penumbra in his 2-inch finder at $4^h\ 15^m$.

Color and Brightness of Eclipsed Moon. The photographic studies of this eclipse by Mr. Clyde W. Tombaugh and his co-workers at the Lowell Observatory (see previous article) would appear to establish that this eclipse was an unusually dark one. Mr. Kosdon estimated the stellar magnitude to be - 4 at $6^h\ 7^m$ (beginning of totality), - 1.5 to - 2 at $6^h\ 51^m$ (near middle of totality), and - 3.5 at $7^h\ 27^m$ (end of totality). Once or twice I found the totally eclipsed moon to be far brighter than Sirius and thus perhaps - 3 or - 4 in stellar magnitude, but at unspecified times. My impression, apparently shared by J. Russell Smith, was that the eclipse was rather average, neither the brightest nor the darkest of those I have so far seen.

Franklin Kosdon in a 10-inch reflector, and with very good seeing, found the interior parts of the umbral shadow to have a copper hue. At $6^h\ 4^m$, just before totality, he remarked "yellow-gray part of umbra near western limb about 5 minutes in width"; and at $7^h\ 30^m$, just after totality, the yellow gray part near the eastern limb was also about 5 minutes wide. Using a 12.5-inch reflector at 101X, average seeing but very good transparency, I found the umbra yellow in its outer portions verging into a light red farther from the edge of the umbra and then into a darker red closer to the center of the umbra. The yellow outer border moved from the northwest limb through lunar north to the northeast limb during the course of totality. Jack Eastman of Manhattan Beach, Calif. found the moon a definite orange during totality, and another observer described it as "the color of dried blood."

Lunar Meteor Searches. A total lunar eclipse affords an unusual opportunity to search both for possible lunar meteors and for possible lunar meteoritic impact-flares. Only when the light of the moon is thus dimmed can observers over almost half of the earth simultaneously search for these phenomena. A number of observers in the United States and Canada made such searches on November 18, 1956. What follows here is based upon the report of Mr. Robert M. Adams, our Lunar Meteor Search Recorder, supplemented in some places by later information.

The following people sent in reports:

Observer	Station	Telescope
James Berg	Dyer, Ind.	4-inch refl., 48X
Billy J. Ditto	Memphis, Tenn.	2-inch refr., 30X
W. F. Duncan	Galveston, Texas	6-inch refl., 75X
Walter H. Haas	Las Cruces, N. Mex.	12.5-inch refl., 101X
Ian McLennan and others	Edmonton, Alberta	?
Robert Miles	Woodland, Calif.	12-inch refl.
Montreal Centre	Montreal, Quebec	
1. Tom Noseworthy and Robert Venor		12-inch refl., 60X
2. Katherine Zorgo, Dorothy Yane and Ted Morris		6-inch refr., 45X
3. S. Sundell and E. Danson		6-inch refl., 50X
4. M. MacKensie and I. K. Williamson		80-mm. refr., 30X
Paul Nemecek	Whittier, Calif.	12.5-inch refl.
L. J. Robinson	Sylmar, Calif.	10-inch refl.
Donald A. Rosenfield	Chicago, Illinois	3-inch refr., 10X
J. A. Westphal	Tulsa, Okla.	8-inch refl., 51X

The following people wrote that they were all prepared to observe but were clouded out:

Clinton B. Ford, Suffield, Conn.; Lyle T. Johnson, Welcome, Md.; G. H. Johnstone, Albuquerque, N. Mex.; Jerome Kaltenhauser, Lindstrom, Minn.; and Eugene Spiess, Manchester, Conn.

Mr. Berg reports seeing a "lunar" meteor at $6^h\ 7^m$, U.T. It originated at a point near the eastern wall of Cleomedes, travelled northwestward past the northern edge of Burckhardt, and disappeared near the south wall of Bernoulli. The duration was about one second, color was white, and seeing was fair.

Mr. Ditto reports a very bright flash of light easily visible with the naked eye at $6^h\ 21^m$, U.T. near the crater Wilhelm I. He states that he saw a faint flash of light near the crater Hevelius at $6^h\ 24^m$. Both lights were termed gold in color. He also reports a brilliant red flash at $6^h\ 37^m$ near the Carpathian Mountains. The duration of each of these events was approximately 1.5 seconds, and all were stationary on the lunar surface.

Mr. Duncan reported two flashes. At $6^h\ 33^m$, U.T. there was a possible dim flash northeast of Aristarchus, and at $6^h\ 42^m$ there was a white medium flash close to the south wall of Gassendi.

I observed from $6^h\ 10^m$ to $7^h\ 25^m$. Seeing was 4 to 5 on a scale of 0 to 10, with 10 best; and transparency was 5 on a scale of 1 to 5, with 5 best. There were a few interruptions, and the total observing-time was 67 minutes. The estimated limiting stellar magnitude for lunar meteors or impact-flares was 11. I found no evidence of lunar meteors or "flashes".

Mr. Miles observed during totality until $7^h\ 30^m$. He also reports no evidence of lunar meteors.

Mr. McLennan and his co-workers also had negative results - no less valuable on that account.

The Montreal observers reported negative results except that Mr. Venor saw a flash just before totality and before the others on the team had started their observations. The time was $5^h\ 59^m\ 42^s$, U.T.; and the observed position was over the Doerfel Mountains. Therefore, Mr. Venor's discovery neither confirms nor denies the observations of the others. This team, like the one at Edmonton, assiduously observed all during totality. Miss I. K. Williamson submitted the report for the Montreal team.

Mr. Nemecek suspected two faint pinpoints of light east of Messier and Pickering sometime during totality.

Mr. Robinson suspected a streak at $6^h\ 35^m$, extending from Albategnius and terminating just inside Mare Nubium. In addition, he saw a fairly bright and prolonged flash at $5^h\ 14^m$ at the crater Wichmann and a "telescopic meteor" at $5^h\ 12^m$ above the northeast portion of the moon.

Mr. Rosenfield saw a yellow meteor at the edge of the moon going north. It was over and about the length of Mare Smythii at $6^h\ 43^m$, U.T., plus or minus one minute. The duration was perhaps as little as 0.1 seconds, and the object was very bright in a 3-inch telescope. A haze prevented observations after 7^h.

Mr. Westphal observed from $6^h\ 10^m$ to $6^h\ 42^m$ and from $6^h\ 53^m$ to $6^h\ 58^m$. Transparency was 4 (1 - 5), and seeing was 4 (0 - 10). No flares or "flashes" were seen or suspected.

Mr. Adams concludes: "An examination of the observations indicates that there were no confirmations. There were no overlappings in time or in place. The flares that were seen at $6^h\ 33^m$, $6^h\ 35^m$, $6^h\ 37^m$, and $6^h\ 42^m$ were all in definitely different locales so that they cannot be construed as overlapping even though watches may have been in error by a minute or two. In all probability the lights that were seen were earthly meteors. Earthly meteors are certainly not uncommon, particularly the telescopic variety. The writer averages about 15 hours observing for variable stars every month spaced over some 10 nights, and thus far this year [early December, 1956] he has seen some 30 telescopic meteors ranging from about 7th magnitude to the 14th. The number seems to rise for fainter magnitudes. (These are reported to Dr. Olivier of the American Meteor Society.)

"We hope that out old observers together with our neophytes will continue to send in reports. In case the writer doesn't reply to all correspondence, he will always try to have the observations printed in The Strolling Astronomer. Please adhere to the schedule as printed on pg. 61 of the May-June, 1956 issue. Perhaps some of you wonder why I steer clear of comments, discussion, etc. It is because I think observation should be completely untrammeled by any kind of theory."

One criticism of the observations must be made. Exact timing, if possible to the nearest second, is essential if we are ever to have a valid, duplicate observation of one of these phenomena. Apparently at this eclipse only Mr. Venor recorded times more accurately than to the nearest minute.

Other Lunar Meteor Searches. On June 11, 1957 Mr. John P. Bagby of Evanston, Ill. wrote us of a search he had organized for possible lunar meteors during the eclipse of November 18, 1956. Thirteen stations were ready to participate in the search, eleven had clear skies; and four stations recorded one or more bright objects against the moon. Mr. Bagby summarizes the results:

"Thirty-five objects in all were seen: 9 of these showed a position angle of travel, 5 were seen simultaneously by three observers, the prizes went to those with lowest power probably because they didn't have to move their eyes much to see most of the disc."

Perhaps the most remarkable results were obtained by Mr. John Mavrogianis and four others at Warren, Ohio, using 8 power, 5½-degree field monoscopes. Observing from $4^h 0^m$ to $7^h 45^m$, U.T., they recorded fully 25 transient luminous objects against the moon between $6^h 3^m 40^s$ and $7^h 18^m 50^s$! It was evidently at this station that five objects were seen simultaneously by three different observers of the team. Most of the 25 objects were stationary yellow flashes of about the sixth stellar magnitude. At Cheyenne, Wyoming five bright flash-points of light were seen with a 3-inch refractor at the edge of the moon between $5^h 35^m$ and $5^h 40^m$, U.T. They were white in color and had a stellar magnitude between three and four. Another group at Cheyenne with a 3-inch reflector recorded a fixed light, enduring about four seconds, at $5^h 46^m$ and a meteor-like object at $7^h 50^m$. At Melvindale, Michigan Mr. John Hanowich in a 6-inch reflector recorded three minute flashes in rapid succession about a minute before totality began.

These additional data, for which we thank Mr. Bagby very much, do not appear to me to change Mr. Adams' conclusion that a duplicate observation of a lunar meteor or impact-flash is still to be made. The 25 Warren, Ohio objects, although in part observed in duplicate at that station, must have been largely or wholly somewhere in the earth's atmosphere; for sixth magnitude objects would have been very conspicuous to those other observers using 6-inch telescopes and larger if such objects had been on the moon. The Warren observers merit our praise for the carefulness of their timing. Combining these reports of Mr. Bagby's teams and the others cited earlier, we still have no evidence, through a necessary agreement in time and in lunar location, that any object was recorded at two different stations.

Searches for Possible Eclipse-Caused Changes. Curious changes repeated each lunation occur in many lunar regions, as he who will compare near-terminator and near-full moon appearances can easily verify. A few bold souls have even thought that perhaps here we have evidence of the existence of certain physical changes (e. g., the growth and decay of plants or the evaporating of frost) at the surface of the moon. The theoretical objections to this interpretation are formidable, but an observational test is to see whether the apparently variable areas are affected by the rapid and considerable changes of temperature which occur during eclipses of the moon. Searches for such possible eclipse-caused changes must be conducted with some care, for it is easy to be misled. One telescope at one magnification must be used throughout the program, and the observer must be wary of spurious changes caused by variations in seeing and transparency. The post-eclipse appearance must be compared to the pre-eclipse (normal) appearance and, if possible, also to the appearance in other lunations. Control-observations of the areas being watched for possible eclipse-caused changes should be attempted both on the night before and on the night after the one of the eclipse. It is easy to be misled by spurious effects when the area is very close to the edge of the umbra and is thus considerably dimmed. Finally, the wise observer will compare the sise and intensity of areas being watched for possible eclipse-caused changes to the size and intensity of selected neighboring lunar areas.

After this lengthy preamble, I must confess that the only observers who have reported looking for possible eclipse-caused changes at this eclipse are Jack Eastman and myself. Mr. Eastman speaks of "an apparent change in the dark spots on the floor of Arzachel, along with an apparent brightening of the light streak across Mare Serenitatis". (We wonder whether Alphonsus is here meant rather than Arzachel.) Mr. Eastman gives no further details so that we cannot assess the validity of the reported changes.

My own observations were made with a 12.5-inch reflector at 202X; and after the moon had attained a good altitude by 3^h, U.T., the sky was very clear, and the seeing was fair to fairly good (four to seven on a scale of zero to ten, with ten best). The results found with various "variable" lunar areas were as follows:

1. Alphonsus. The three main dark areas were the same at $2^h\ 43^m$ and $5^h\ 2^m$ (before immersion in umbra) and at $8^h\ 14^m$ (after emersion from umbra).

2. Atlas. The intensity and general appearance of the two main dark areas on the floor, the one near the south wall and the other west and northwest of the central mountains, and also of the curved dark band connecting these two areas were observed frequently and carefully from $2^h\ 26^m$ to $9^h\ 26^m$. Atlas was in the umbra from $6^h\ 5^m$ to about $8^h\ 5^m$. No evidence of change was found.

3. Eratosthenes. Careful and frequent estimates were made of the intensity of a number of dark areas on the floor and walls of this crater. Evidence was found of a temporary darkening of a dark area just northwest of the central peaks. To permit our readers to weigh this evidence for themselves we shall present in a table the observed intensities of the affected area and of three other Eratosthenes dark areas. The intensities here given are on a scale of zero (shadows) to ten (very brightest marks). The four areas were designated as follows: A, a small dark area just northwest of the central peaks of Eratosthenes; B, a dark area just east of the central peaks; C, a dark area east of B and in the east central part of the floor; and E, a dark area just outside the northeast rim. In the table the seeing (S) is on a scale of 0 to 10, with 10 best; and the transparency (T) is on a scale of 1 to 5, with 5 best.

U.T.	S	T	Intensity A	Intensity B	Intensity C	Intensity E
$2^h\ 22^m$	3-4	4	1.2	2.0	2.2	2.5
$3^h\ 28^m$	4	5	1.0	2.0	2.2	2.5
4 32	5	5	0.8	2.2	2.2	2.8
4 54	5	5	0.8	2.2	2.2	2.8
5 14	5	5	0.5	2.2	2.2	2.8
5 26	5	5	0.5	2.0	2.0	2.5
Eratosthenes in umbra from $5^h\ 36^m$ to $7^h\ 55^m$.						
7 57	5	5	0.2	2.0	2.0	2.5
8 10	5	5	0.0	2.0	2.0	2.5
8 29	5	5	0.2	2.2	2.2	2.8
8 49	4-5	5	0.8	2.2	2.2	2.8
9 5	5	5	0.5	2.8	2.8	-

U.T.	S	T	Intensity A	Intensity B	Intensity C	Intensity E
$9^h\ 19^m$	6	5	0.8	2.2	2.2	2.8

On November 17, 1956 at $6^h\ 5^m$, S 3 and T 5, I made these estimates: A 1.0, B 2.0, C 2.0, and E 2.8. On November 19, 1956 at $5^h\ 46^m$, S 6 and T 5, I made these estimates: A 1.2, B 2.5, C 2.5, and E 2.2.

The table indicates that Area A was abnormally dark when it emerged from the umbra, returning to its pre-immersion intensity by about $8^h\ 49^m$, almost an hour after it left the umbra. Areas B, C, and E show no such effect. Area A was darker soon after emersion than the same intervals of time before immersion, with the same seeing and transparency; and the November 17 and 19 intensity estimates confirm that the darkness during the hour following emersion from the umbral shadow was abnormal.

4. Grimaldi. The intensities of some bright spots, actually all small craterlets, along the west edge of Grimaldi were carefully observed from $2^h\ 16^m$ to $8^h\ 26^m$. Grimaldi was in the umbra from $5^h\ 7^m$ to $7^h\ 35^m$. No changes were found.

5. Linné. The size and intensity of the white area around this famous crater at full moon were carefully compared to adjacent white spots of similar appearance on the Mare Serenitatis from $2^h\ 7^m$ to $8^h\ 53^m$. Linné was in the umbra from $5^h\ 50^m$ to $8^h\ 3^m$. Contrary to results reported at a number of past eclipses, Linné on this occasion showed no change.

6. Messier and W. H. Pickering. These twin craters were probably the same at $9^h\ 1^m$ (after eclipse) as at $2^h\ 40^m$ (before eclipse).

7. Plato. The major floor craterlets (seen as white spots at full moon) were probably the same at $2^h\ 38^m$ and at $8^h\ 1^m$.

8. Riccioli. The south tip of the dark area in this walled plain has been reported temporarily to lighten and fade out during several past eclipses. I found it this time to be the same at $4^h\ 28^m$ (before immersion) and at $7^h\ 42^m$ (after emersion).

A Possible Anomalous Occultation. Mr. Paul J. Nemecek of Whittier, Calif. reports on a curious occultation which he witnessed at $6^h\ 33^m$, U.T. as follows: "Moon occulted fourth stellar magnitude star near Pleiades. Star remained on limb about 5 seconds before disappearing behind limb. Star faded slowly away in magnitude as it hovered at limb." Mr. Nemecek was observing with a 12.5-inch reflector at 150X (16.3 mm. Erfle ocular). He had seeing 6 and transparency 4 on the usual scales. Mr. Nemecek also writes of seeing a halo around the star before it disappeared. This observation derives added interest from the fact that Mr. Robert M. Adams at Neosho, Missouri during this same eclipse of November 18, 1956, while watching a star that was occulted almost tangentially, suspected "a slight depression of light intensity just before its disappearance." Mr. Adams was concentrating upon searches for possible lunar meteors and failed to record the stellar magnitude, time of occultation, or other data which might perhaps help us decide whether or not he and Mr. Nemecek suspected the gradual fading at occultation disappearance with the same star.

Anomalous occultations of stars by the moon are not extremely rare in the literature but have often been explained by such things as irregularities at the lunar limb or a doubling of the affected star. What is here of great interest is that two widely separated observers, quite unknown to each other, may fully independently have witnessed the same peculiar and quite unexpected appearance with the same star. Unfortunately, we cannot be certain that they did observe the same star because of the lack of detail in Mr. Adams' report. It should also be mentioned that Jack Eastman and others at Manhattan Beach, Calif. timed the occultation of "a fifth magnitude star", probably the one observed by Mr. Nemecek, to occur at $6^h\ 36^m\ 35^s$, U.T. They mention no anomalies. Mr. Clyde W. Tombaugh and I have examined plates taken by himself and his co-workers at the Lowell Observatory during this eclipse (see his article in this issue) in an attempt to identify Mr. Nemecek's star. We have identified it as that star on Figure 50 which was occulted during the 15-minute exposure; it lies to the left of the moon on this photograph and slightly below the center. The stellar magnitude, however, is not four nor five but instead seven.

Photography of Eclipse. Photographs of this eclipse have been kindly contributed by Jack Eastman, J. Russell Smith (8-inch refl.), and Frank Vaughn (10-inch refl.). Mr. Vaughn had the most successful results as regards fineness of lunar detail on the prints. He was, moreover, specifically attempting to develop a good photographic technique for the study of eclipse-caused changes; and we shall hence give his results as reported by himself in some detail, hoping that others will imitate them at future lunar eclipses. Mr. Vaughn's work was done with a 10-inch reflector of 95 inches focal length, Tri-X Film, and X-500 developer at Madison, Wisconsin. He reports:

"Tri-X Film. This product, using suitable development, apparently has a good speed corresponding to A.S.A. 1,000 or more on images of low intensity. Its advantages for lunar and planetary photography are therefore obvious. Its faults (in the writer's hands) include (1) a rather narrow exposure range for good contrasts, and (2) rather frequently occurring spurious 'markings' on the emulsion as developed and fixed. This latter fault is not serious, but suggests caution in interpretation. It is thus probably wise to make several exposures of an object, and to make sure the negatives selected for study are unencumbered in critical regions by these false shadings. They may, of course, often be recognized as such and ignored where they do not actually obscure or distort what is being studied. Despite the foregoing, Tri-X should be recognized as a valuable addition to the photographer's tools, as it will do a job in instances where no other product known to the writer is adequate. A 'light' negative gives the best results, with No. 4 or 5 paper (Eastman). As a generalization, it may be safely said that in planetary and lunar photography a dense negative on Tri-X is not worth printing, as contrasts become very low with any real density of the image on the fixed film.

"Conditions of the Observations. The pre-eclipse sky in Madison was nearly overcast, all pictures being taken as the moon appeared through narrow rifts in the clouds. Owing to these conditions, it was not possible to note the exact time for the pre-eclipse pictures, but all were taken between $3^h\ 0^m$ U.T. and $4^h\ 0^m$ U.T., and are given as $3^h\ 30^m$ U.T. The post-eclipse sky was clear, but with increasing haze, which terminated the program at $8^h\ 41^m$ U.T.

"Schickard Region. Photographs at $3^h\ 30^m$, $7^h\ 56^m$, $8^h\ 3^m$, and $8^h\ 16^m$, U.T. The two large floor areas were compared with each other, and with other nearby areas. Within limits imposed by the photographs no eclipse-caused effects were noted. It will be well to note here that the photographs are variable in quality (sharpness and contrast), and that any conclusions derived from them are similarly variable as to reliability.

"Grimaldi-Riccioli. Photographs at $3^h\ 30^m$, $7^h\ 48^m$, $8^h\ 1^m$, and $8^h\ 16^m$, U.T. No effects due to the eclipse are apparent to the writer on a fairly close examination of the photographs. It is thought that the pictures are of a good enough quality to detect any appreciable fading of the south tip of the Riccioli area, if it existed. A note should be made of the nature of the southern tip of the dark Riccioli area, which may possibly explain why it can be interpreted as 'fading' under specified conditions. The south tip is not solidly shaded and hence relies for its full visibility on at least fair seeing, without too much scattered light (as imposed by haze, for example). The writer has observed this area to be much blunted by poor visibility simply as a result of poor seeing, or haze, and suggests this cause as a possibility in explaining the earlier reported shortening of the south tip of the Riccioli area, where conditions have worsened from pre- to post-eclipse observation.

"Atlas. Photographs at $3^h\ 30^m$, $8^h\ 27^m$, and $8^h\ 33^m$. Pre-eclipse photo poor, but southwest dark area apparently unaffected in any major respect. Area in northwest of floor not well enough shown in pre-eclipse photograph to form any useful basis of comparison with later pictures.

"Aristarchus. Photographs at $3^h\ 30^m$, $7^h\ 45^m$, $8^h\ 8^m$, and $8^h\ 36^m$. This photo-

PHOTOGRAPHS OF SELECTED LUNAR REGIONS DURING TOTAL LUNAR ECLIPSE ON NOVEMBER 18, 1956 BY FRANK VAUGHN WITH A 10-INCH REFLECTOR. SEE TEXT FOR DETAILS.

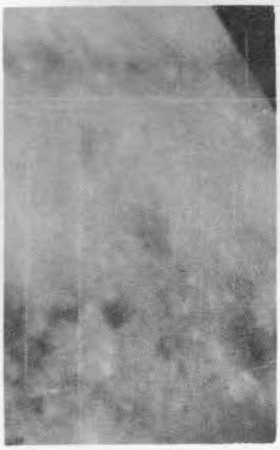

Figure 51. Schickard. (left). $3^h\ 30^m$, U.T. 1/25 sec.
Figure 52 (right). Schickard $7^h\ 56^m$, U.T. 1/15 sec.

Figure 53. Grimaldi-Riccioli $3^h\ 30^m$, U.T. 1/25 sec.

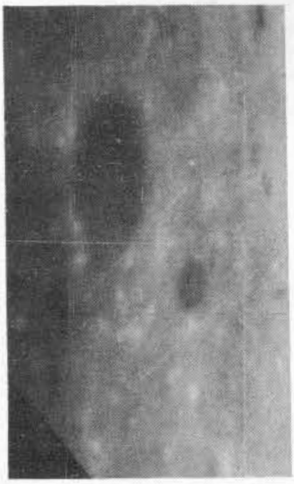

Figure 54. Grimaldi-Riccioli. $7^h\ 48^m$, U.T. 1/15 sec.

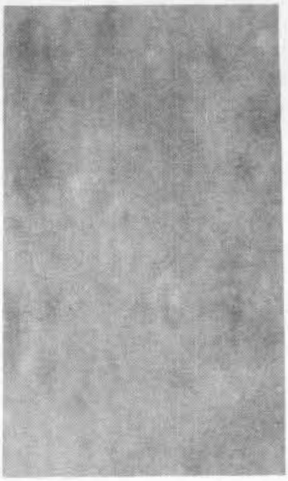

Figure 55. Atlas $3^h\ 30^m$, U.T. 1/25 sec.

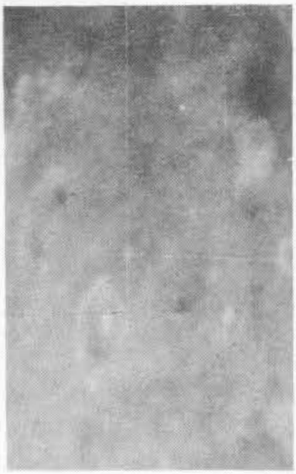

Figure 56. Atlas $8^h\ 27^m$, U.T. 1/15 sec.

graphically difficult crater shows approximately the same aspects at $3^h\ 30^m$, $7^h\ 45^m$, and $8^h\ 8^m$, with respect to the two principal wall-bands. The photo made at $8^h\ 36^m$ shows some differences from the others, but inasmuch as it is of poorer quality no suggestion is made that it represents anything of significance with respect to possible changes caused by the eclipse.

"Conclusions. This eclipse proved satisfactory, partially in showing that relatively small telescopes used photographically can be of some value in programs involving detail of considerable fineness, but principally in pointing the way for improvement in both techniques and programs in future studies. For example, much better photographs would have made possible more positive statements in respect of some objects, and pictures more extended in time after the eclipse would have been equally beneficial. On the other hand, the writer feels confident that no major changes were involved in Riccioli, Aristarchus, or Schickard, at least as far as the period covered by the photographs is concerned."

Figures 51 to 56 on pg. 71 are samples of Mr. Vaughn's eclipse photographs. The amount of detail shown, in so far as it is here successfully reproduced, deserves much praise.

OBSERVATIONS AND COMMENTS

Concerning This Issue. This 72-page anniversary issue of The Strolling Astronomer will count as six ordinary issues, from January to June of 1957. Subscription renewals will be handled on this basis.

It will also be noticed that there has been an increase in the size of this periodical as compared to recent issues. We have had several complaints that the printing was so small as to be rather difficult to read. We have gone to a larger size of issue in order to decrease the amount of photographic reduction of our original typewritten sheets by the offset process employed. We hope very much that you will all find that the resulting larger size of the print makes for more comfortable reading; however, we shall be very glad to have your opinion about our slightly new look in any case.

Linné. G. H. Johnstone writes that he glimpsed a small, crescentic shadow here on March 9, 1957 at colongitude 2°.0, using a Cave 6-inch reflector at 300X. He compares the appearance to C. D. Reid's drawing on pg. 94 of our July-August, 1956 issue.

Aristarchus. In a letter on January 29, 1957 Mr. Elmer J. Reese comments on Mr. J. D. Bestwick's chart of the Aristarchus dark wall bands on pg. 95 of our July-August, 1956 issue: "I am gratified with the generally good agreement between his chart and mine. Mr. Bestwick's chart shows a branch leaving Band D about halfway down the wall. Apparently it was this northern branch that gave Band D an 'unusual' aspect on October 8, 1949 (Str. A., Sept., 1950, Fig. 2). Note that the chart and Figure 2 both show a narrow band along the south edge of Band A. E. E. Hare's drawing of Sept. 24, 1950 (Str. A., Vol. 5, No. 8, Fig. 4) apparently shows only the northern branch of Band D.

"My conclusion that Band B rarely, if ever, reaches the crest of the wall does not seem to be popular with lunarians. Dr. Bartlett has expressed his disagreement, and Mr. Bestwick's chart supports his view. On the other hand, Dr. H. P. Wilkins' drawing with the 33-inch refractor (Str. A., July, 1952, Fig. 2) distinctly shows Band B extending little more than halfway up the wall. Commenting on his photograph of Aristarchus with the 36-inch reflector of Greenwich, Mr. E. A. Whitaker states (J.B.A.A., Vol. 65, No. 8, pg. 348): 'The slide shows the small, very bright central elevation, the comparatively dark periphery of the floor, and four radial bands on the north, east, and south walls, the northeastern band being obviously Y-shaped and failing to reach the crest of the walls."

1954 A.L.P.O. Map of Mars. The attention of readers is directed to this splendid map of Mars, here reproduced on pgs. 36 and 37.

Mr. Frank Vaughn informs us that the 1956 map of Mars has now been drawn, and we hope to mail out copies along with this issue. He sends a copy of this map to each subscriber with his compliments.

A. L. P. O. Convention Reminder. We again invite all readers to make a special effort to be with us at Kansas City on September 2 for astronomical papers, exhibits, gossip, discussion, and good fellowship. An afterthought: some of you expert amateur photographers might like to click away at the League's National Convention there, including our small part of it. Perhaps such pictures will become an historical record of great appeal in the days and years to come.

A number of the Convention papers will appear in the next issue of this periodical. If you cannot come, you will not want to miss them; and if you can come, you may still wish to read some of the papers at your leisure.

The Strolling Astronomer

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