The Strolling Astronomer

ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS

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Photograph of Comet Alcock II (1959 f) by Alan McClure on September 4, 1959, $12^h\ 1^m$ - $12^h\ 14^m$, Universal Time. 13-minute exposure in blue light. 5½-inch f/5.0 Zeiss Triplet. Visual magnitude estimated at 5.5 with 12 x 70 binoculars. Compare to photograph by Dr. Elizabeth Roemer on September 1, 1959, with 40-inch reflector, p. 686 of **Sky and Telescope** for October, 1959. Stars trail into streaks during guiding on most comets.

THE STROLLING ASTRONOMER

Pan American College Observatory
Edinburg, Texas

In This Issue

ANNOUNCEMENTS

The Season's Best. At this writing (November 23, 1959) it is still difficult to foresee when this issue will be published and mailed. Nevertheless, we wish to take this opportunity to wish each and every one of our members a most Merry Christmas and a very Happy New Year. Good health, good luck, and good seeing in the year ahead!

American Ephemeris and Nautical Almanac for 1960. Regular observers who have not yet done so should certainly immediately order this volume for 1960 from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. The price of the clothbound edition is $4.00. There are several changes in format in the 1960 volume from what has been employed for many years. Most of those changes affecting amateur lunar and planetary observers should be rather obvious; but if not, we may carry a short article on the subject in a future issue. The A.E.N.A. includes such tables as colongitudes, central meridians of Mars and Jupiter, angular diameters of the bright planets, positions of satellites of Jupiter and Saturn, the phases of Venus and Mercury, and much other information of value in lunar and planetary astronomy.

A Retraction. Our "In Memoriam" for Mr. Jacob Herrmann on page 97 of the September-October, 1959 issue was an error. The information came from a kind of source which one would not normally challenge. We are glad to learn that we were misinformed, and we wish Mr. Herrmann many years more among us.

Contributors to A.L.P.O. Exhibit at Denver. Mr. David Meisel supplies the following list of those who supplied drawings, charts, photographs, or other material for the A.L.P.O. Exhibit at the Nationwide Amateur Astronomers Convention: Carlos E. Rost, Lyle T. Johnson, Jack Eastman, Jr., Alika K. Herring, David Meisel, Craig L. Johnson, Dale P. Cruikshank, Frank R. Vaughn, Pan American College, Willaim Kunkel, and Thomas R. Cave, Jr. The order above is without meaning. We are sorry for any possible omissions or errors in the list.

A.L.P.O. Members at Denver. The following A.L.P.O. members registered in our cubicle at the N.A.A.C.: Thomas A. Cragg, Inglewood, California; Gary Wegner, Bothell, Washington; Steve Bieda, San Jose, California; Stanley Emig, Leavenworth, Washington, Dale P. Cruikshank, Des Moines, Iowa; Stuart Emig, Leavenworth, Washington; Robert Provine, Tulsa, Oklahoma, Karl Engel, East Aurora, New York; Dr. Robert Wonderley, Jefferson City, Missouri; Mark Zillman, Danville, Illinois; Ernst E. Both, Buffalo, New York; Craig L. Johnson, Boulder, Colorado; Clifford R. Ramsey, Tulsa, Oklahoma; Leonard Abbey, Jr., Decatur, Georgia; William Kunkel, Los Angeles, California; Dave D. Morrison, Danville, Illinois; Phil Glaser, Menomonee Falls, Wisconsin; Lyle T. Johnson, Welcome, Maryland; Gordon Hall, Milwaukee, Wisconsin; Robert Farmer, Houston, Texas; Tim Fitzgerald, Houston, Texas; Arlen Ferguson, Houston, Texas; Allan Parker, Houston, Texas; S. Walsom, Toronto, Ontario; Wayne Schaefer, Villa Park, Illinois; Joe S. Miller, Beverly Hills, California; Jack Eastman, Manhattan Beach, California; Tom Quinn, Los Angeles, California; W. E. Shawcross, Cambridge, Massachusetts; Richard Angel, Whittier, California; Natalie R. Leonard, Davis, California; Ralph A. Worley, Shreveport, Louisiana; David D. Meisel, Fairmont, West Virginia; Dennis Milon, Houston, Texas; E. L. Clark, Bartlesville, Oklahoma; Beaufort Ragland, Richmond, Virginia; Hoy J. Walls, Chevy Chase, Maryland; W. I. Abbott, Dallas, Texas; C. L. Parker, Englewood, Colorado; James L. Martin, Pueblo, Colorado; Howard J. Watson, St. Paul, Minnesota; William F. Shelton, Jr., St. Albans, West Virginia; Tim Wyngaard, Madison, Wisconsin; E. Downey Funck, Delray Beach, Florida; Minick Rushton, Atlanta, Georgia; Victor W. Killick, Sacramento, California; George Doschek, Pittsburgh, Pennsylvania; Frank Vaughn, Madison, Wisconsin; J. A. Westphal, Tulsa, Oklahoma; Walter H. Haas, Edinburg, Texas; Gregory H. Lamb, Detroit Lakes, Minnesota; Edwin F. Bailey, Philadelphia, Pennsylvania; William H. Glenn, New York, New York; Paul D. Bevis, China Lake, California; Alan McClure, Los Angeles, California; Roy K. Ensign, Fullerton, California; James Styczynski, San Jose, California; Tom Osypowski, Milwaukee, Wisconsin; Elvyn C. Winne, Quantico, Indiana; Mr. and Mrs. LeRoy Garvin, Wilmington, Delaware; Kenneth L. Timmons, Danville, Illinois; and Richard J. Machemer, Centerport, Pennsylvania. There is thus a total of 62 registrants from all parts of the country and one from Canada. A few of the signatures were hard to decipher, and we apologize for any errors made.

Frequency of Issue. It is our New Year's Resolution to do our best to publish *The Strolling Astronomer* on a regular schedule at two-month intervals during 1960. The issues will thus be bimonthlies and will probably usually contain 28 pages.

PLANETARY APPULSES AND OCCULTATIONS IN 1960

Dr. Gordon E. Taylor, H. M. Nautical Almanac Office, Royal Greenwich Observatory, Herstmonceux Castle, near Hailsham, Sussex, England, has very kindly sent us the following list of occultations and near-occultations (appulses) of stars by planets in 1960. We thank Dr. Taylor for giving us this information in advance of its publication in the B.A.A. *Handbook*. We urge our observers to make special efforts to observe these phenomena and to report promptly their findings to us. The cooperation of colleagues outside of the United States is here essential because of the limited geographical area of visibility of any one occultation or appulse. Special efforts should be made, of course, to detect the effects of a planetary atmosphere on a star at occultation disappearance and reappearance, even visually but also with more refined techniques.

Special interest must attach to the occultation of BD -21° 5359 by Saturn and its rings on April 30 and May 1, 1960. This phenomenon provides an unusual opportunity to study in an independent manner divisions in the rings. Merely determining how many divisions exist by direct observation is subjective and difficult so that we urge our members having large enough telescopes to make every effort to study most carefully this passage of a star through the ring-system. The very slow angular motion of Saturn at the time and the consequent long period of time consumed by the passage will give observers over most of the inhabited world an opportunity to contribute to this project. It must not be neglected!

Rather large apertures and also good seeing are extremely advantageous in observing planetary occultations of stars. It is doubtful that anything less than eight inches can deal effectively with the seven occultations listed below, and twice that aperture will be much better.

Dr. Taylor's data follow.

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1. The following appulses, all in 1960, may be of interest to observers:

Date	Time of Conjunction	Star	Mag.	Geocentric Separation	Horizontal Parallax
		VENUS			
Apr. 23	$13^h 11^m$, U.T.	80 Piscium	5.7	12"	5"
Apr. 28	23 51	269B.Piscium	6.6	21	5
Nov. 26	15 15	172B.Sagittarii	5.7	7	8
		MARS			
Jan. 29	03 08	C.D.-23° 14758	8.7	5	4
Mar. 15	18 53	B.D.-17° 6237	9.0	19	4
Apr. 3	00 12	B.D.-12° 6218	8.3	9	4
May 3	22 18	B.D.-4° 5939	8.5	5	5
May 4	22 42	B.D.-3° 5702	9.0	4	5
May 14	18 58	B.D.-0° 21	8.6	5	5

Date	Time of Conjunction	Star	Mag.	Geocentric Separation	Horizontal Parallax
		MARS (CONTINUED)			
May 16	03^h53^m, U.T.	B.D.- 0° 35	8.6	3	5
May 16	15 46	B.D.- 0° 42	7.9	20	5
June 1	15 00	B.D.+ 4° 166	7.7	20	5
June 9	03 06	B.D.+ 6° 216	9.0	6	5
		JUPITER			
Jan. 10	16 14	C.D.-22° 12008	8.7	4	1
Feb. 9	07 39	C.D.-22° 12237	8.4	0	2
June 21	23 26	C.D.-23° 13662	9.0	11	2
July 2	04 54	C.D.-23° 13598	8.4	27	2
Oct. 6	09 37	C.D.-23° 13589	8.3	3	2
Nov. 5	04 38	C.D.-23° 14011	9.0	8	2
Dec. 7	03 21	C.D.-23° 14580	6.3	21	1
Dec. 10	09 43	C.D.-23° 14633	9.0	48	1
		SATURN			
Apr. 24	01 57	B.D.-21° 5359	9.0	14	1
May 1	01 11	B.D.-21° 5359	9.0	1	1
June 17	21 42	C.D.-22° 13730	8.8	46	1
Sept. 4	05 23	C.D.-22° 13397	8.0	17	1

2. The following occultations by Mars in 1960 have been predicted:

Date	Star	Area of Visibility	Station	Disappearance U.T.	Disappearance P.	Reappearance U.T.	Reappearance P.
May 4	B.D.-3°5702 ($9^m.0$)	S. Asia	Hyderabad	22^h38^m	87°	22^h41^m	227°
May 16	B.D.-0° 35 ($8^m.6$)	Iberia	Madrid	03^h50^m	38°	03^h53^m	276°
June 9	B.D.+6°216 ($9^m.0$)	Iberia N.W. Africa	Madrid	03^h02^m	82°	03^h05^m	234°

3. The following occultations by Jupiter in 1960 have been predicted:

Date	Star	Area of Visibility	Station	Disappearance U.T.	Disappearance P.	Reappearance U.T.	Reappearance P.
Feb. 9	C.D.-22°12237 ($8^m.4$)	Central & S. America	La Plata	06^h59^m	94°	08^h15^m	270°
June 21	C.D.-23°13662 ($9^m.0$)	Central &	La Plata	22^h35^m	237°	24^h29^m	121°
		S. America	Helwan	22^h23^m	244°	24^h26^m	115°
		Europe	Greenwich	22^h24^m	245°	24^h30^m	113°
		S. Asia	Cape	22^h29^m	238°	24^h24^m	120°
		Africa	Hyderabad	22^h20^m	243°	LOW	
Oct. 6	C.D.-23°13589 ($8^m.3$)	Australasia	Sydney	08^h45^m	102°	10^h35^m	261°
		E. Asia	Wellington	08^h46^m	103°	10^h35^m	260°
			Tokyo	SUN		10^h35^m	267°

4. Saturn and its rings will occult the star B.D. -21°5359 ($9^m.0$) between April 30 and May 1, 1960. As Saturn is so near its stationary point any accurate form of prediction is impossible. In fact the planet's motion is only 1" per hour. Very approximate times only are given.

		DISAPPEARANCE U.T.	P.	REAPPEARANCE U.T.	P.
Outer edge of Rings	April 30	04^h	258°	May 1 18^h	075°
Limb of Saturn	April 30	15^h	261°	May 1 11^h	071°

5. No passages of planets in front of radio sources are predicted.

THE AMATEUR MARS OBSERVER AND SOME NOTES ON THE 1958-59 APPARITION

By: Thomas R. Cave

(Paper read at the Fifth A.L.P.O. Convention at Denver, Colorado, August 28-31, 1959.)

To the novice in telescopic astronomy Mars is perhaps of paramount interest of all the planets. Undoubtedly this circumstance is almost always due to the emphasis placed on Mars in the popular press and in the readable elementary astronomical books studied first by the beginner. The beginning telescopist looks forward to a coming apparition of Mars with great anticipation. He has already acquired a general reading knowledge of Mars, and now needs only wait until the planet is well placed for telescopic observation. With very few exceptions indeed, early views of Mars are of great disappointment to the beginner. He has already observed the ever-changing markings on the cloud belts of Jupiter, and he has also enjoyed some truly charming views of Saturn; but Mars is a far more difficult object. The apparent angular diameter of Mars never much exceeds one-half the average diameter of Jupiter and in fact at a mean opposition is somewhat smaller than the ball of Saturn. Very small telescopes, even those of excellent quality, do not deal well with the small, bright reddish disc of Mars. The beginner, still lacking a well trained eye for planetary observing, probably finds that he must have a first class optical and mechanical instrument of at least six-inches aperture in a reflector or at least a five-inch first quality refractor.

There have always been two important rules in the telescopic study of Mars, first: truly good "Seeing", and second: a good telescope of minimum adequate aperture. Some periods of "Good Seeing" can be found in most parts of the United States during some seasons of each year and at some hour of the night. Much good "Seeing" is missed by many observers since it frequently occurs in those hours well after midnight. Many amateurs more from imagination than from experience have tended much to overrate the "Seeing" conditions at the observing stations made famous from studies of Mars. True, locations such as Flagstaff, Mt. Hamilton, Mt. Locke and in Europe the Pic-du-Midi do enjoy periods of outstanding "Seeing", but they also have their share of fair to poor conditions.

It is unfortunate that the beginner usually finds Mars such a difficult and disappointing telescopic object: however, he can do something about this situation. His telescope should be as large as he can afford, but it should also be as fine as obtainable. He will do better to have a very well mounted and comfortably usable telescope of somewhat smaller aperture than an awkward and poorly mounted telescope of larger size, but in all cases it must be optically near perfect.

No novice can hope to accomplish much on Mars unless he is willing to begin observations as long as possible before opposition. In reality this means rising in the small hours just before dawn, beginning several months prior to opposition and observing as frequently as possible. Those last hours just before dawn and during sunrise may often prove surprisingly good for "Seeing". Some of the finest views I have ever had of Mars were obtained at dawn. As a brief example, I recall one early morning at the Lowell Observatory in July, 1956, when Mars had a disc apparent diameter of only 16". I was an overnight visitor at the Observatory and readily accepted an invitation to be at the 24" refractor at 3:00 A. M. At that

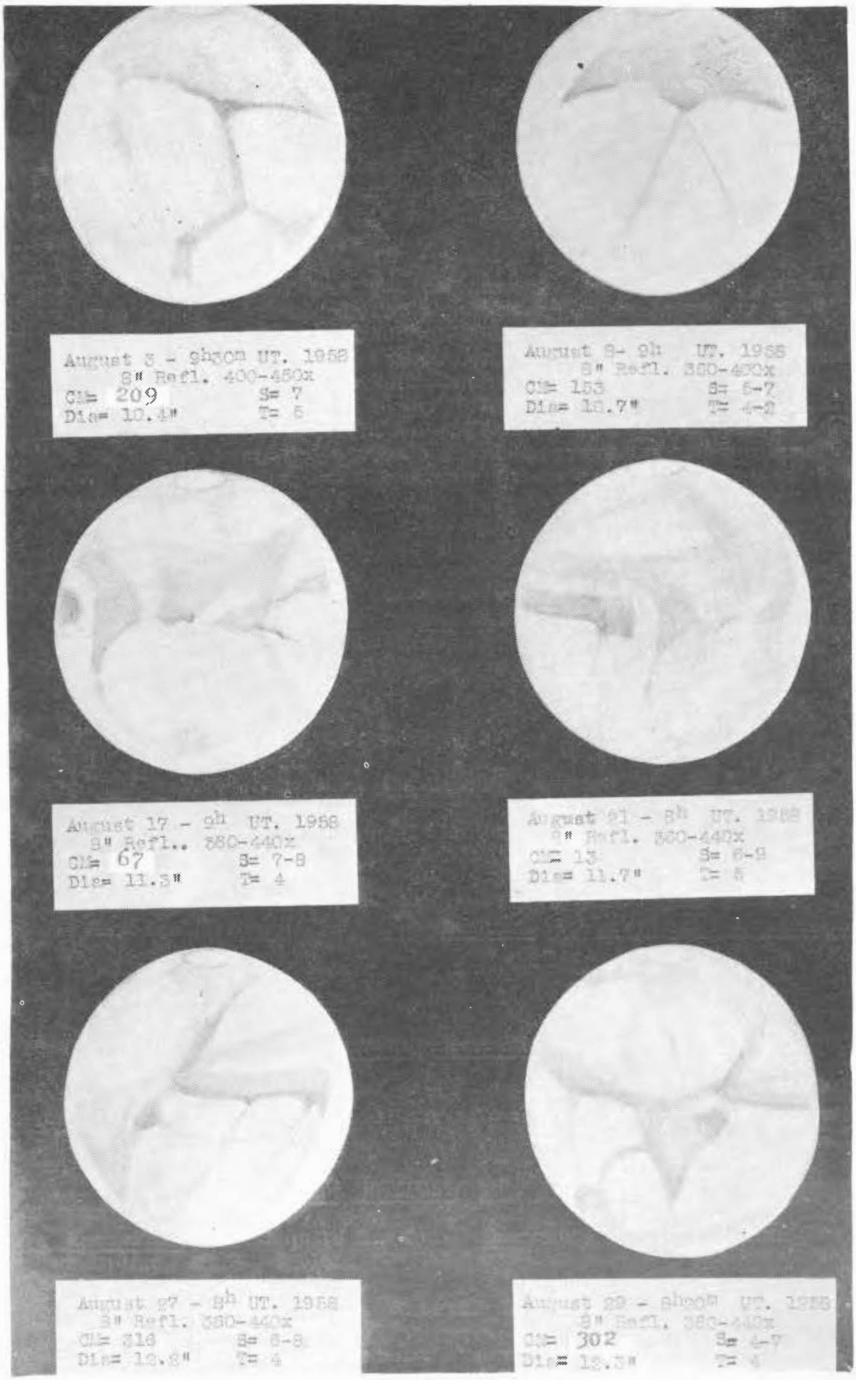


FIGURE 1. Some drawings of Mars in 1958
by Thomas R. Cave.

hour "Seeing" was poor, and Mr. Giclas was finishing some routine photos of Mars in blue light. There seemed little hope at that moment of seeing much on the Martian disc; however, two hours later in the early light of dawn the atmosphere very rapidly settled down, and the "Seeing" by sunrise was all but absolute perfection. It is actually impossible to convey any real idea of what was visible at that moment on Mars, fine minute details in the maria and many faint half-tones in the Martian northern deserts plus numerous fine brilliant points about the South Polar Cap were obvious details. I have had the good fortune to have several other equally good and perhaps better views of Mars, at Flagstaff, Long Beach, and elsewhere; but that particular occasion will always remain in my memory, and it is an excellent example of how "Seeing" may suddenly improve.

The observer who has acquired a good telescope should take every possible advantage of periods of good "Seeing". He will do well frequently to sketch whatever he can actually see and he should make notes as to "Seeing", clearness or transparency, the diameter in seconds of arc of Mars, the central meridian of longitude observed, and in addition any unusual appearance of details seen. Almost every observer's first attempts at sketching Martian details will appear crude; often much detail may hardly later be recognizable when compared with a good map, such as the 1954 or 1956 A.L.P.O. Maps of Mars. However crude and unimportant his early drawings may seem, the new observer will find soon that he has benefited enormously from his drawings. He will quickly acquire a far more accurate and critical eye for detail than he could ever have otherwise. Once he begins a regular observing program of Mars, he will learn the correct preparation of the outline of the disc for his drawings, calculation of the central meridian, and the use of other important physical data.

It has been suggested by some astronomers that the new observer of Mars should not consult existing maps or globes of the planet, in as much as these will adversely affect his own original observations and cause him to see much which is not there. In part this may be true; however, no serious beginner can long refrain from learning the correct nomenclature of all the main Martian features. In years to come he will discover that he has become as familiar with the face of Mars as with the geography of his own planet.

There are a few misconceptions that a great many amateurs have regarding observing Mars. About three years ago Mars reached that place in its elliptical orbit when it was nearer the Earth than at any other time in more than 32 years. This perihelic opposition actually occurred about one week after the date of closest approach. The dates of Martian oppositions and closest approaches of Mars to the Earth always differ by at least several days. On several occasions near the dates of some of the past oppositions of Mars I have heard experienced amateur astronomers announce at club meetings planned star parties "to observe Mars on the night of opposition". This magical term "opposition night" has seemed to hold a singular fascination for the amateur observer, since the inexperienced planetary observers seem to feel that they can see something more on Mars on this exact date than at any other time. The date of closest approach might seem more appropriate; however, in reality, usually as much can be seen for three or four weeks on each side of opposition and of course when "Seeing" conditions are good. Another outstanding misconception is that simply because a casual observer cannot see very much Martian detail in his telescope, an experienced planetary observer using an equal or smaller aperture cannot observe much more fine detail. It is probably as much the man behind the telescope as the instrument itself that counts. One of the most esteemed and famous planetary observers in our time is Mr. Elmer Reese, of Uniontown, Pennsylvania. He is perhaps most famous for his many years spent in serious study of Jupiter; however, a famous astronomer at the Lowell Observatory told me that Mr. Reese's work on Mars, i.e., his superb drawings, compare always exceedingly well with the better Lowell Observatory photos made at about the same dates and central meridians. Mr. Reese has for many years used a good but simple 6" Newtonian reflector for all his observational work. This should be a singular reminder to those who despair of having to use very modest equipment and complain that their telescopes are really too small for anything like serious planetary observing.

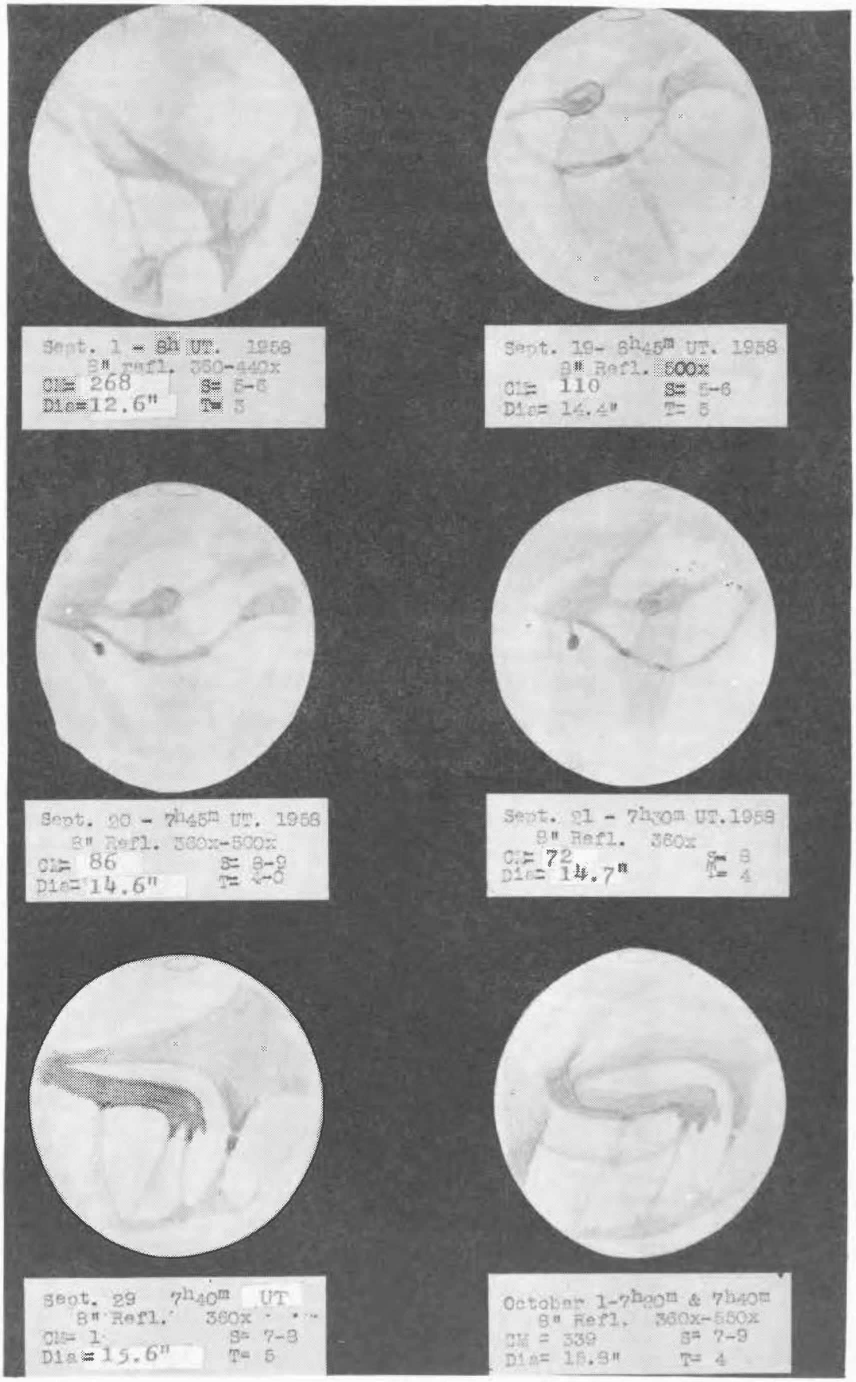


FIGURE 2. Some drawings of Mars in 1958 by Thomas R. Cave.

Fortunately during the Summer, Autumn and early Winter of 1958 we enjoyed frequent periods of excellent "Seeing" at Long Beach, California. Most of my own observations of Mars were made in 1958 with an 8" F/7 (54" f.1.) Newtonian reflector, although my 12" reflector was employed on a number of occasions near the times of closest approach and opposition in late October and through November. Since telescopic magnifications applied to Mars are often of interest, especially to the beginning observer, I mention that 450X on either reflector was the highest power I could ever employ to advantage. Higher powers were occasionally used, but above 450X nothing more in the way of fine details could ever be detected even under a few occasions of very superb "Seeing". My observing program was threefold: the careful observation and sketching of Mars whenever "Seeing" permitted and always when some detail of special interest was seen; regular observations, visual, using a Wratten #47 Eastman blue filter for visual indications of "blue clearing"; and regular patrol work for Martian atmospheric clouds, both yellow and white. The International Mars Committee has been especially anxious for experienced observers, even those doing solely visual work, to participate in the last two programs. On nearly all occasions a Red Wratten #25A filter and Yellow Wratten K-2 color filters were employed to increase contrasts between the maria and deserts. The Wratten deep blue #47 was also useful in detecting the limits of the Northern Cloud Cap of Mars as well as for the "blue clearing" work.

Regular and serious observations were begun early in August and continued until about the end of January, 1959. During this six month period the apparent diameter of the Martian disc was always above ten seconds of arc. The total number of observations made was 89; full disc drawings of Mars were made on 41 nights when it was felt that "Seeing" conditions or details of special interest warranted sketching the planet. Observations for the visual detection of "blue clearing" were made on 67 occasions, but I felt certain of "blue clearing" on only 9 nights, of which only 2 nights were near the time of opposition.

The Martian South Polar Cap was a very conspicuous marking during June, July, and until the end of August; however the dark "Melt Band" or border about the Cap was at times only faintly seen, although usually prominent in mid-September. The South Cap rapidly diminished in size in August and September and often seemed covered with a mist or haze, particularly during early August. During October and November the Cap was often hazy in appearance; however, the North Cloud Cap was occasionally seen very large and bright.

Time does not permit more than a few comments on details of special interest during the 1958-59 apparition. The area which first became prominent in 1954 near the Wedge of Casius and which was probably detected as a major change by Dr. E. C. Slipher in South Africa continued to increase somewhat both in size and intensity in 1958. This new area labeled Thoth on the new IAU map of Mars was very much foreshortened in 1956 due to the planet's near-maximum southern tilt then, and most observations of this new detail were unsatisfactory during that year. During October and November, 1958 this area appeared to fill in with maria-type detail to the south, and appeared even more intense in December, 1958 to February, 1959. Should this be a long-enduring change, the 1960-61 apparition may reveal Mars to have a very large dark area east of the Syrtis Major and larger in area than this famous marking. The Trivium Charontis and Elysium areas were exceptionally prominent and frequently easy objects with a $3\frac{1}{4}$" Brashear refractor. The major maria were all of normal contrast during the entire apparition, none appearing to exhibit any tendency to look diffuse or faded as during nearly all of the closest part of the 1956 apparition of the planet.

The Solis Lacus region was often beautifully defined on several of its presentations during the six observable months. A rather peculiar feature was the disappearance of the Fons Juventae during November and the remainder of the apparition. This tiny exceedingly black "Drop of Ink" was frequently easily visible during August to early November at each presentation of the general area of the Solis. Indeed, this tiny detail was easily seen in the $3\frac{1}{4}$" refractor on at least two occasions in October.

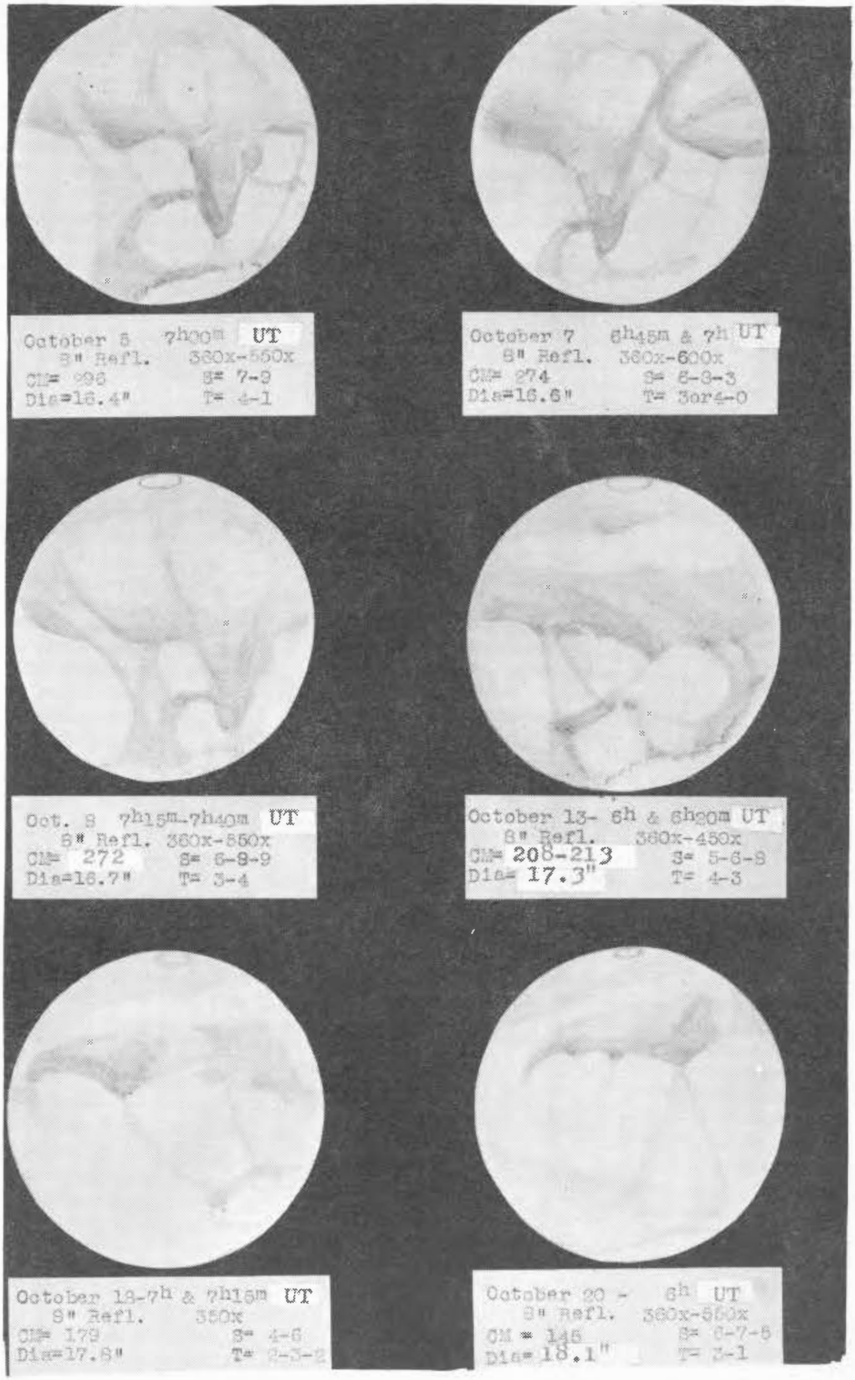


FIGURE 3. Some drawings of Mars in 1958
by Thomas R. Cave.

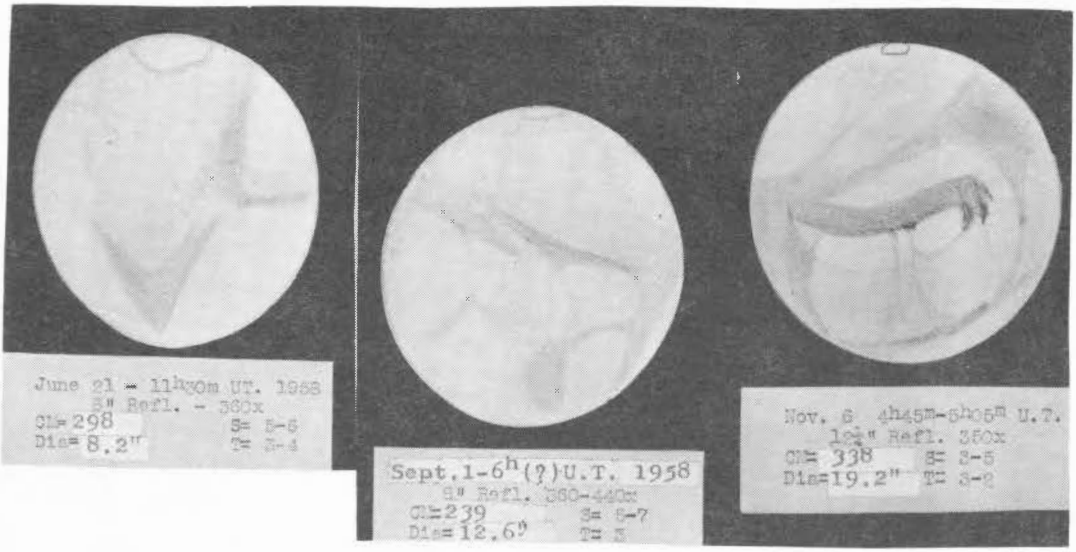


FIGURE 4. Some drawings of Mars in 1958 by Thomas R. Cave.

Of very special interest during the 1958-59 apparition were the several clouds of short duration observed by Mr. W. H. Haas over the general area of Ausonia at dawn on September 16, and a beautiful high terminator cloud projection I detected on September 20 for nearly 45 minutes, being first seen just past 7:00 hours U.T. The most prominent white cloud which I observed occurred on October 13 and 14, being centered over Libya. Since this area had been most carefully observed on the two evenings immediately previous on which no brilliant white area was evident, I at once wired the Lowell Observatory on October 13 when I first detected this bright cloud. Many years ago Jarry-Desloges suggested that observers should pay particular attention to the Libya region of Mars; his observing staff at Setif, North Africa had observed the formation of a rather large number of clouds in this area from 1911 to 1918.

I have observed Mars whenever possible through eleven complete apparitions since 1937, and have on several occasions been fortunate to use briefly several of the world's largest telescopes, including the Mt. Wilson 60" reflector, the Lowell 24" refractor, and once the Yerkes 40" refractor. Based on my own experience I feel that the serious observer may do very good work on the planet with telescopes in aperture sizes frequently found in the amateur's possession. He must above all be patient and he should not give up his observations because of early failure to see all the Martian details he may wish. If he persists, he will soon begin to see much of the finer and fascinating details of our near neighbor in space.

PHILIPP FAUTH'S CONTRIBUTION TO SELENOGRAPHY

By: Ernst E. Both

"Selenography: the study of lunar topography and cartography of the Moon."

Although Philipp Fauth's life was excellently sketched in a recent article (Sky and Telescope, November 1959), there remains the problem of

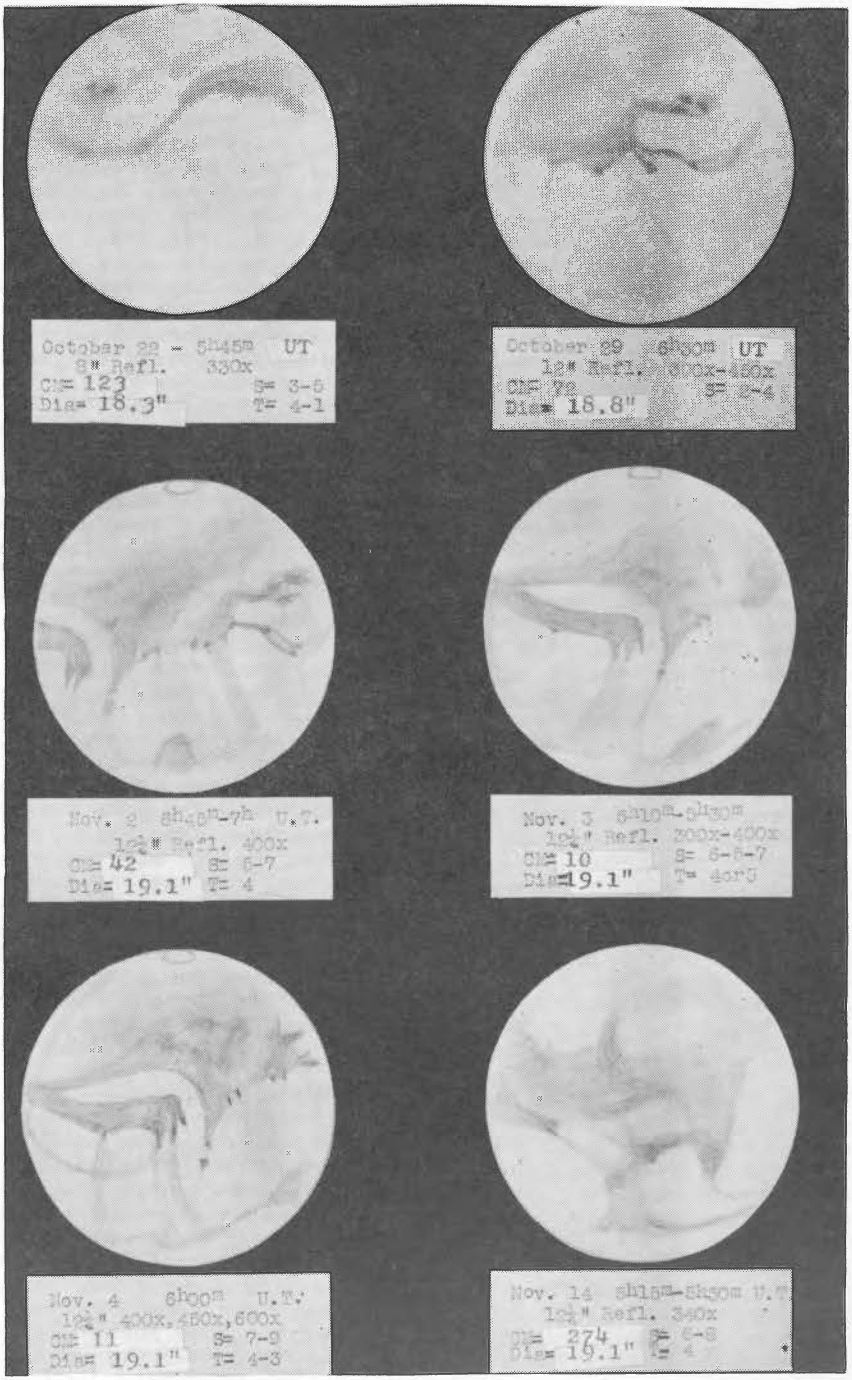


FIGURE 5. Some drawings of Mars in 1958
by Thomas R. Cave.

Fauth's position in the history of selenography and his contribution to the study of the Moon. Until the publication of his large map of the Moon, any evaluation of Fauth's contribution must necessarily be incomplete and one can at best outline the many aspects of his lunar studies with a few bold strokes.

Of the 19th centruy selenographers, only Lohrmann, Maedler, Schmidt, and Neison may be called "classics" in the sense that all four produced a complete topographical map of the Moon together with a description of the lunar surface, based entirely on his own close scrutiny of each feature depicted and described. (Maedler is the perfect example and perhaps the greatest selenographer of them all. Lohrmann's description remained incomplete although the map was finished. Schmidt's description never materialized, although it had been planned. Neison depends to a great extent on his predecessors both in his text and in his map.) Of the three leading selenographers of the 20th century (Fauth, Goodacre, Wilkins), only Fauth qualifies as a "classic" in the above sense; for both Goodacre and Wilkins offer outline charts instead of topographical maps, charts which make use of photographic detail, and their descriptive texts are based to a good measure on the work of their contemporaries. (Wilkins actually extended the work of Goodacre. Both of them were directors of the BAA Lunar Section.) By contrast, Fauth offered a topographical map and descriptive text based entirely on his own work.

Fauth's main contribution to 20th century selenography is embodied in his monumental map and in his book UNSER MOND (Our Moon, published 1936). In this volume of almost 600 pages he describes the entire surface of the Moon in terms of his own studies of each feature carried out over a period of 50 years, chiefly with the aid of a 15½-inch refractor. For each crateriform structure described, Fauth gives the diameter in kilometers according to his own measurements from photographs (over 3500 diameters, generally in good agreement with measurements by Arthur and Young), together with the depth for the more important craters, as well as all available height measurements (i.e., those of Schroeter, Maedler, Neison, Schmidt, and some of his own). Individual structures are described in terms of global relations, following the plan of Maedler. With each important feature Fauth also discusses the work of his predecessors and contemporaries critically. The most attractive feature of this work is the nice balance of quantitative and qualitative information, thus making it by far the best description of the Moon's surface since Maedler, although intended only for the advanced student. (Being written in German, it is virtually unknown to American and English students of the Moon. A translation would be extremely desirable.) This text was to be accompanied by his great topographical map 11½ feet in diameter (scale 1:1,000,000) which, however, Fauth was never able to get ready for publication owing to his death in 1941. He left the pencil drafts for the entire map, and these are now being prepared for publication (in 1960) by his son Hermann Fauth.

Fauth began work on this map in 1895. In that year he published an atlas of 25 selected areas which were intended to be part of the map. These areas were executed in hachures, following the practice of Maedler and Schmidt. Subsequent selections, published in 1932 and later, were drawn in pseudo-contour lines (contour lines based on careful estimates rather than measurements) and others in illuminated contour lines (Copernicus, Sky and Telescope, November 1959, page 24). Already in 1895 Fauth had pointed out that a general map of the Moon ought to be on a scale of 1:1,000,000, while central portions of the Moon ought to be drawn on scales of 1:500,000 or even 1:250,000 (in each case he offered examples to prove that such scales were possible and necessary). When published, this map will consist of 25 sections executed in pseudo-contour lines (a reduced section may be found in Sky and Telescope, November 1959, page 20). Fauth's map and text are a logical extension of the maps and texts of Maedler and Schmidt both in size and content. The map in particular represents the ultimate of what an individual can accomplish as an individual.

Other contributions may be listed briefly:

Estimates of slope angles in great numbers (details in UNSER MOND under the various formations; no separate catalogue published).

Among the first systematically to chart the limb areas of the Moon (South Pole, Mare Humboldtianum, Bailly, etc., 1932-1937 and after).

Nomenclatorial map on a scale of 1:4,000,000 (1936) to supplement the I.A.U. Map of the Moon and his own large map.

Proposal to contruct unforeshortened views of selected areas and offer of some examples (Mare Crisium, Copérnicus). Work of this nature is now being carried out by Dr. Kuiper and the U. S. Geological Survey.

Insistence that photographs must form the basis for visual cartographic work at the telescope (recently also advocated by E. A. Whitaker and G. Fielder of the BAA Lunar Section).

Stress on the importance of both quantitative and qualitative studies (published in great detail in 1895).

Whatever the final verdict on Fauth's work will be, there is no denying that he represents the last "classic" among the selenographers. There is also no denying that his lunar work deserves far more attention than it has received thus far.

THE GREAT DOME NEAR VITRUVIUS

By: Joseph Ashbrook and Ernst E. Both

Southwest of Vitruvius is a highly interesting formation, as large as Eratosthenes or Aristillus, which has been surprisingly overlooked in English-language lunar literature. Inadequately represented on practically all maps of the moon, this feature has also failed to receive any official designation.

The center of this object is located at Xi=+.534 ±.003, Eta= +.288 ±.003, in the coordinate system of the IAU map. For a general description, it is hard to better Fauth (1): "At sunrise, the entire, almost circular formation appears as an unbelievably flat dome, somewhat like a planiconvex lens without appreciable edge thickness, and with an extremely small slope angle."

The earliest observers seem to have been Beer and Maedler (2), who measured its height twice, 1833 April 8 and 1834 April 27. They speak of it as "a broad, nearly flat, dome-shaped plateau," but give no name. Schmidt observed it 1854 September 26; he refers to it once in his book (3) as Maraldi d, and once as the dome Vitruvius d. The latter designation had, however, earlier been used by Beer and Maedler for the large ruined ring just to the west, called Vitruvius D on the IAU map.

Because the IAU name list (4) omits the Maedler-Schmidt dome entirely, we shall for convenience refer to it in this paper as Maraldi d.

This formation has been observed on 9 nights in 1958-59 by Ashbrook, using 6-inch and 10-inch reflectors, with the following results. Maraldi d is nearly circular, with a diameter of 37.3 ±1.5 miles. At solar altitudes of $h_\odot = 1^\circ.0$ and $h_\odot = 1^\circ.3$, the dome is crossed by the terminator. A valley about 4 miles wide passes over it approximately in a N.-S. direction. This valley must be extremely shallow, for it is not entirely shadow-filled even at $h_\odot = 1^\circ.3$.

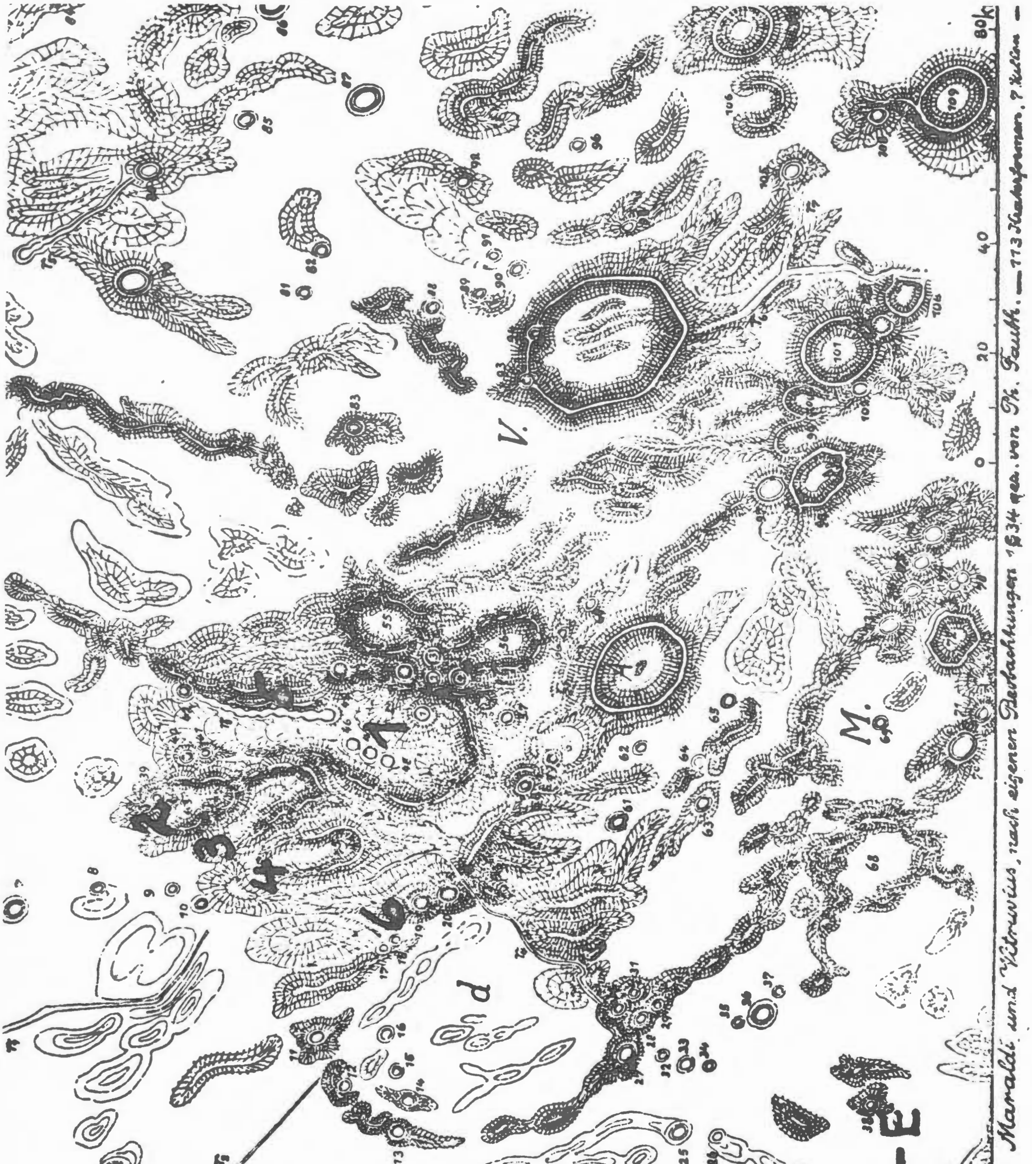


FIGURE 6. The great dome near Vitruvius, reproduced from Philipp Fauth's book, <u>Unser Mond</u>, from observations in 1934 with a 15½-inch refractor.
V=Vitruvius; A=Vitruvius A; M=Maraldi; d=Vitruvius D
The key-numbers, 1 through 6, are referred to in the text.

[Here $h_{\odot}$ is the altitude of the sun above the lunar horizon at the position of the lunar formation. It may be obtained from the formula:

$$\sin h_{\odot} = \sin b \sin B + \cos b \cos B \cos (1-L),$$

where b is the sun's selenographic latitude, 1 is the sun's selenographic longitude, B is the lunar latitude of the lunar formation in question, and L is its lunar longitude. The first two quantities are taken from the tables for physical observations of the moon in <u>The American Ephemeris and Nautical Almanac</u>. Lunar latitudes and longitudes may be taken directly from some maps of the moon and on other maps may be determined from the rectangular coordinates Xi and Eta. The formula for $h_{\odot}$ is merely the Law of Cosines of Spherical Trigonometry.--- Editor]

A little later after sunrise, when the sun's altitude is $2^{\circ}.8$, there is conspicuous shadow on the lower E. slope. This shadow is gone by the time the sun is $7^{\circ}.0$ up. From this we can infer that the lower E. slope is inclined about 4° or 5° to the horizontal.

Other information about the slope is available. The height of Maraldi d was measured by Maedler as 3700 and 2900 feet, and by Schmidt as 3000. The mean is 3200 feet. Combining this with the diameter gives $1^{\circ}.9$ for the <u>average</u> slope angle. From the observed shading of Maraldi d it is evident that the outer part is steeper than the central region. Hence our two determinations, $1^{\circ}.9$ for the average slope and $4^{\circ} - 5^{\circ}$ for the outer slope, are quite compatible.

There are two steeper portions of the edge of Maraldi d, to the SE and NE, separated by a more gently sloping tongue. The height of the SE scarp has been determined on two nights:

1958 December	16.003 U.T.	$h_{\odot} = 4^{\circ}.3$	1900 feet
1959 March	14.976	$6^{\circ}.1$	2300
		Mean =	2100 feet

The NE scarp, which adjoins Vitruvius B, is lower:

1958 December	16.004 U.T.	$h_{\odot} = 4^{\circ}.3$	1700 feet
1959 January	14.984	$8^{\circ}.6$	1700
		Mean =	1700 feet

Maraldi d is still plainly visible when the sun is $10^{\circ}.3$ high; at $h_{\odot} = 13^{\circ}.5$ it is an inconspicuous patch, slightly brighter than its surroundings; when the sun had risen to $h_{\odot} = 16^{\circ}.9$, this dome was unrecognizable in a 6-inch reflector, except for the two gray shadings marking the SE and NE scarps.

These numerical data are supported and extended by Both's observations in 1957-58 with an 8-inch refractor. He finds the SE part of the dome apparently the steepest, the scarp just N. of Vitruvius B showing some true shadow even with a solar altitude as great as 10°. The W. side has no shadow after the sun is higher than $3^{\circ}.5$. The NW edge is a little steeper, casting a shadow at $h_{\odot} = 4^{\circ}$, which is however gone by $h_{\odot} = 7^{\circ}.3$.

The accompanying chart (Figure 6) showing the detailed structure of the dome was drawn by Fauth in 1934 from observations with a $15\frac{1}{2}$-inch refractor. Since his book in which it first appeared is relatively inaccessible, Fauth's description, as translated by Both, is given here in full: "Under a low sun one recognizes an extremely flat, almost circular dome of 60 km, whose south-eastern edge turns into a curved horn-like formation [1 on Figure 6] toward the south-east. Its steep edge borders a depression in the west, which presents itself as a valley opening toward the south [2 on Figure 6], and which cuts the dome almost in half. To the west of it two smaller [3 and 4 on Figure 6], wide, and shallow valleys open also toward the south. Traces of collapse and a craterlet have been found in the center of the dome. The steep eastern edge is continued northward by a crater valley [5 on Figure 6], and only to the east of this can one find what older maps indicate: four non-circular depressions with broken walls. These turn into two many-structured rows of hills between A and Vitruvius, paralleled by another row coming from A. The western edge of the dome forms the eastern edge of the wall rest of D [6 on Figure 6], which is studded with valleys and craterlets. The long cleft running past Cauchy in the west starts at the south-western foot of the dome." (5).

There can be scarcely any doubt that this formation should be classed as a dome. It meets the three essential criteria: circular or rounded outline; very small slope angle, allowing its identification as a dome only when it is on or very close to the terminator; and presentation, under a very low sun, of the shadings characteristic of such prototype domes as the one in Darwin and the pair north and east of Arago. The special features of Maraldi d, considered as a dome, are its great size and its unusually rough surface. We interpret this as additional evidence that surface roughness increases with increasing dome diameter, as a rule.

The great dome near Vitruvius warrants more study by observers of the moon. Drawings would be very desirable. This is by no means a difficult object--it was first discovered with a 3 3/4-inch aperture, while Patrick Moore (6) found it independently with a 3-inch refractor. In a 6-inch Maraldi d is very prominent when close to the terminator.

Bibliography

1. Philipp Fauth, Unser Mond, Breslau, 1937, p. 147.

2. W. Beer and J. H. Maedler, Der Mond, Berlin, 1837, pp. 104, 106, 221-222.

3. J. F. J. Schmidt, Charte der Gerbirge des Mondes. Erläuterungsband, Berlin, 1878, pp. 51, 139.

4. Mary A. Blagg and K. Mueller, Named Lunar Formations, London, 1935.

5. Reference 1, pp. 151-152.

6. Letter.

THE CAPTURE OF THE MOON

By: Dr. Francisco Aniceto Lugo

Among the various scientific hypotheses on the origin of the Moon, or on its presence within the Solar System beside the Earth, those which deserve the greatest consideration among astronomers are that of Sir George Darwin and that of Von Weizsäcker.

The tableau Darwin paints us on the birth of the Moon is certainly very interesting. According to his theory, the Moon was part of the Earth many millions of years ago. At that time there was no kind of life on our globe. The Earth was an irregular pasty globe, with scarcely a crust but with violent melted materials inside and contracting by stages. Due to the interior pressure toward the surface, the Earth was assuming the form of a pear of more than 8,000 miles in length. The Earth rotated on its axis at an amazing speed, i. e., very much more rapidly than now, by virtue of which on account of the physico-chemical state in which its materials were, they flowed toward one of its ends. When five centuries had passed, the girdle of the pear was growing more and more thin, finally becoming so weak that the Earth set free a protuberance in space, which became the Moon. This new body began to revolve around our planet. The Earth as well as the Moon became more and more spherical and have remained closely associated down to the present. Therefore, in Darwin's theory, the Moon did not unfasten itself from the Earth without violence. An enormeous explosion, of inconceivable power, never dreamed of by man, was the result. A tremendous uproar shook the terrestrial atmosphere, and our planet staggered. The Moon had been born; but it was then a blazing ball made of lava in space and not the wrinkled old woman, although smiling, which we know today.

Other astronomers have given daring touches to this outstanding scientific concept of Darwin. From the great concavity of the Pacific Ocean the Moon is conjectured to have emerged; and it is unavoidable to admit that, according to very serious studies, the materials of that part of the Earth and those of the Moon have an extraordinary resemblance. On the other hand, W. H. Pickering has made us to understand that the Pacific area, from which it is assumed that the Moon broke away, is almost circular. With the Moon's parturition, there were created fractures in the recently formed and weak terrestrial crust, by virtue of which, as the parts separated, the continents were formed, then in a different form from now.

But, as is usual in dealing with cosmogonical events, at the moment of the parturition no one was there; and we must content ourselves with simple and more or less ingenious conjectures.

Von Weizsäcker paints us a tableau radically different. His explanation of the birth of the Moon is closely related to the origin of the Solar System as a whole. At the beginning, according to Von Weizsäcker, the Sun had no suite of planets. Then it happened that, while the Sun passed through a thick dust cloud, dust particles adhered to it. After millions of years had elapsed, the dust particles became small globes which increased in volume. However, some of these globes thus recently formed were very small and did not constitute themselves into planets, as did the larger. These small globes were attracted, or rather were captured, by the larger globes; and in this way the satellites were formed, among them the Moon. However little we think, we shall observe that the Moon is a globe too large in comparison with our planet for it to be the result of a fission of the Earth. Besides, there are other reasons which make Darwin's theory doubtful enough. In regard to the thesis of the capture of the Moon by the Earth during the formation of the Solar System, it would be more plausible if we might have clear evidence indicating that this phenomenon took place at a time relatively recent.

Many peoples preserve the tradition, which greatly antedates known history, that there was a time when the Earth had no Moon. We find this tradition in peoples very far apart from each other and practically in every latitude of the Earth. This fact would indicate that the capture of the Moon took place when Man already lived on the Earth and was able to observe sensational events, inasmuch as they affected him profoundly (1). According to such traditions, it was not a single Moon that then presented itself to us; there were two (2). Two Moons crossed the space where before there had been none. In the Southern Atlantic a continent disappeared. An advanced civilization vanished in the throat of an abyss. Because of the arrival of the Moon, or of the Moons if there were two, there occurred, as now we know was to be expected, a tremendous cosmical catastrophe. The other Moon, according to tradition, burst into fragments of considerable size, many of which fell upon the Earth, causing hurricanes, floods, earthquakes, and dreadful volcanic eruptions. The land sank and rose alternately. Enormous detonations announced the impact of very large fragments which struck our globe. At the same time, there came a formidable volcanic bombardment; and reddish clouds of enraged whirling gasses and dust covered the sky. Torrential rains were unleashed, and the forests were almost totally devastated. Many mountains sank, and even continents; and others emerged to the surface. Meanwhile, the furious waters, thickly bemired, razed the Earth, drowning the sundered remnants of plants, animals, and men. The Earth had been turned into a cosmic hell!

Fortunately, that Moon which burst was small. If there had instead burst the Moon which we know today, the catastrophe might have been so extraordinarily gigantic that at this time we would not be relating the tale.

But the Moon--that one which accompanies us--did not remain harmless. When it came closer to the Earth, it was less solidified than our globe; and its geological constitution was less explosive than that of our planet. Hence, an interaction began immediately between the Earth and the Moon, which is active yet; in addition, the two bodies have remained solidily locked together so that neither of them moves without the other's receiving immediately the effect of the movement, thus being bound like a yoke of oxen.

The Earth began to experience tides--maritime, terrestrial, and atmospherical--and other phenomena. Also the Moon. But in the Moon the tides became a serious affair. As the lunar globe was much softer than the Earth, the tides caused in it by our planet continually raised and lowered the surface. The Moon, up to the time of its meeting with the Earth, did not have so violent a magma as our globe had in the early periods of its formation. Therefore, the lunar tides caused by the Earth alternately inflated and deflated the lunar globe, causing the magma to rise and to descend incessantly, making ruptures in the crust through which a part of the igneous matter escaped, but without the violence of the volcanic outbursts of our planet.

It was thus that the craters of the Moon were formed. The magma, when being raised, protruded through the lunar surface in pustules or intumescences, large and small, according to the area and the tectonic composition. The superficial portion of these intumescences finally solidified in many regions, disminishing the level of ascension of the magma with the passing of time, while it was becoming more pasty and settled itself when getting cold and as the rising and descending action caused by our planet gradually lessened. The final result was the raising of numberless domes of the most different dimensions on the Moon. Most of these domes remained hollow because of the descent and gradual solidification of the magma; and later, being of a frail constitution, collapsed, falling down along the peg which many had at their centers precisely at the central point of the soil or base, where everybody can see them now. Around these craters the circular walls of the domes remained firm. The craters had been formed!

Other domes did not collapse, and anybody today can see them also on the Moon.

As the magma had no strength to explode and it flowed on account of the unceasing insistence of the Earth, many domes ruptured at their sides, exactly as occurs with pustules formed by smallpox. Through those fissures then escaped gasses, which carried along in suspension mineral substances, probably salts, being strongly expelled radially or almost in all directions around some craters, and obliquely ejected through a great distance deposited on the lunar surface metalloidic or metallic particles in considerable amounts and created what we now call the lunar rays.

References

1. According to recent investigations and discoveries of Professor Johan Hurzeler and other anthropologists, Man existed on the Earth twelve million years ago. The striking consequence of this achievement is that Man must exist almost all that time, until 25,000 years ago or so--as the historians say--in a savage state. Undoubtedly, there were many civilizations unknown to us during the former 11,975,000 years.

2. See on this subject Harold T. Wilkins' Mysteries of Ancient South America.

Note by Editor. Dr. Lugo's address is Puente la Trinidad, Caracas, Venezuela.

LUNAR MISSILE SURVEY FOR LUNIK II

By: Virginia Watkins Capen

A page in the history of mankind was turned when on September 13, 1959, a Russian lunar rocket made contact with the Moon. The Shiraz Observatory had the good fortune of observing the lunar surface in the early morning hours during the time of reported impact. The Observatory is situated at approximately $29^{o}.5$ N. Latitude, $308^{o}.0$ W. Longitude, and 3.5 hours east of Greenwich, in Shiraz, Iran. This position gives us the advantage of being able to observe many astronomical events which are denied observers in the United States because we are nearly on the opposite side of the earth, 8.5 to 11.5 hours from the East to the West Coasts, respectively.

Around 1800, Universal Time, radio B.B.C. stated that the time of impact would be approximately 2102 U.T. We began gathering together tape recorders, cameras, observers, and diverse other items and made our way up Observatory Hill to set up four telescopes consisting of: A 5-inch apogee refractor, a 4-inch Newtonian reflector, a 3-inch Danjon refractor photometer, and a Baker-Nunn 21/31-inch modified Schmidt Camera (Figure 10). A 3-inch diaphragm was made for the Baker-Nunn Schmidt camera, and the three other visual telescopes were provided with either green or yellow filters in case red smoke or dust should be scattered across the lunar surface upon impact. The weather was good that morning; a mild six miles-per-hour wind was blowing from the west, seeing was 2-5, transparency was 5, and the temperature was $75^{o}.0$ F. However, fifteen minutes after we stopped observing the Moon clouds began moving in from the east and eventually created an 8/10 sky coverage.

After setting up the instruments and necessary equipment, we could only wait and hope that we might see something of unusual interest on the Moon. The writer started observing the Moon with the 4-inch Newtonian reflector at 1945 U.T. (0015 Local Shiraz Time) while the rest of the equipment was being set up. The remaining telescopes were put in operation at 2003 U.T.; and constant observation of the Moon was made up through the broadcast time of impact, which was 2102 U.T. (0132 Local Shiraz Time), and was completed at 2120 U.T.

During this time of observation two unusual spots were noted: At 2017 U.T. a dark area, in the Schneckenberg region just southwest of Mare Vaporum, was first noted by Charles Capen, Jr., Colongitude = $46^{o}.10$. Capen said that this dark area suddenly caught his eye. The area was circular and had a well-defined periphery which diffused after about fifteen minutes. The second unusual spot was noticed at 2049 U.T. by Paul Wankowicz. It was a crater near the center of the Sinus Iridum, Colongitude = $46^{o}.37$, which appeared to be surrounded by a white vapor. This spot was continuously observed for a period of one-half hour. To our knowledge, this white area appeared suddenly, slowly changed, and faded. After fading, there seemed to be a slight residue left on the lava flow of the Bay of Rainbows from the middle toward the Prom. Laplace, and somewhat of a circular ring. Note Figures 7 and 8. This change could very well be due to the changing sunlight on the Moon's surface because the Bay of Rainbows was not too far from the terminator at the time of observation. Since this is one of our Lunar Missile Survey assigned areas we have observed this area many times before and had never before noticed any markings similar to this one. It was indeed unusual.

Exposures of .8 second, .4 second, and .2 second were made continually during the lunar observation with the Schmidt telescope. Even though a 3-inch aperture was employed, the results of these photographs were quite dark; and only the terminator markings were definitely noted.

During the time of these observations we were constantly listening to Radio Moscow and to the Voice of America on the Observatory radio, which was amplified directly to the observers on the outside of the Observatory building. At 2100 U.T. the Voice of America program announced the

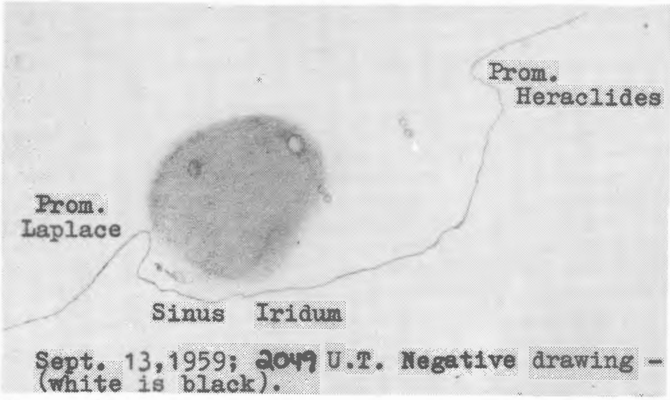


FIGURE 7. **Sinus Iridum as first seen. Refer to text of article by**
Virginia Watkins Capen in this issue.

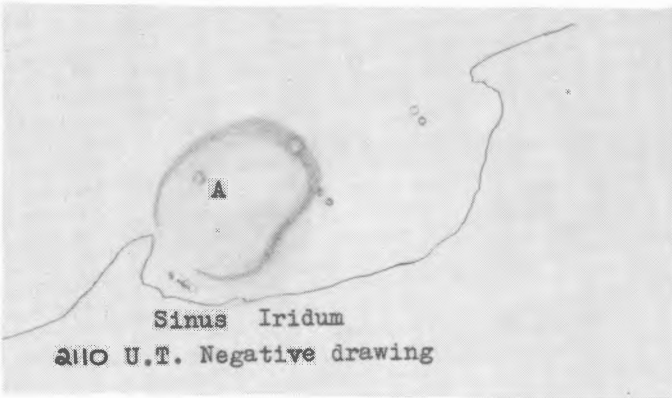


FIGURE 8. **Sinus Iridum after fading. Refer to text of article by Virginia Watkins Capen in this issue.**

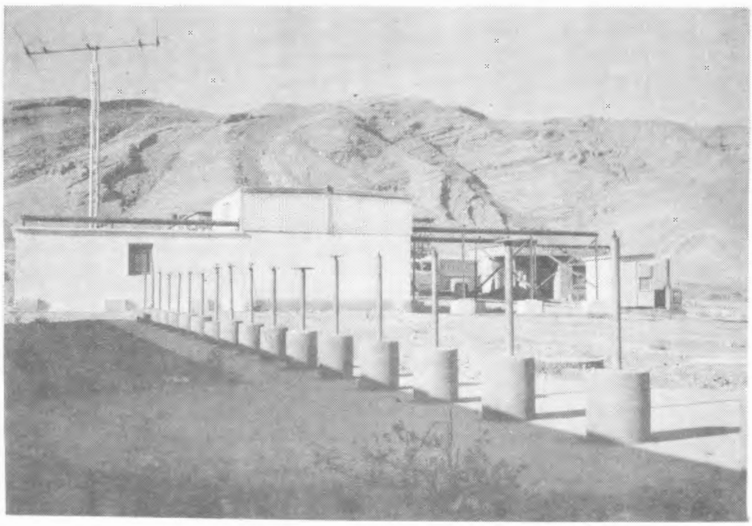


FIGURE 9. The Satellite Tracking Observatory, Shiraz, Iran. The Schmidt Camera House from the Moonwatch Station.

FIGURE 10. The observers and three of the instruments used for the Lunik II observation on September 13, 1959, at Shiraz, Iran.

FIGURE 11. Synchronizing the Schmidt Camera, Norrman Crystal Clock, and Tape Recorder for observation are: C. F. Capen, Director; Hassan Hajeb and Hessam Tavakolian, Iranian Observers. Shiraz, Iran Observatory.

news that the Russian Moon Rocket was due to land on the Moon in one minute's time. Later in the program the news was interrupted with a special bulletin from Washington stating that signals from the Moon Rocket had ceased, indicating that the Russian rocket had landed on the Moon; the time then was 2102 U.T., 0132 Local Shiraz Time. A later report from Jodrell Bank, stating that the Russian rocket impact on the Moon occurred at 2102 U.T., confirmed our time here in Shiraz, thus denoting that we had made a complete observation of the Moon before, during, and after the landing of the Russian Lunik II on the Moon, with negative results.

The observers were Charles F. Capen, Jr., Paul Wankowicz, Hassan Hajeb, and the writer.

The two unusual spots that were noted during the observation will have to be observed more extensively next month and later. It will indeed be interesting to find out if they still exist. Also, it would be interesting to know if anyone else in the A.L.P.O. noticed these or any other unusual markings on the Moon on or near that date and time. It is suggested that any interested A.L.P.O. member should examine carefully the two above-mentioned areas with long-focus instruments for any surface changes.

A STUDY IN COMETARY PROPER MOTION

By: David D. Meisel, Comets Recorder

In The Strolling Astronomer, Vol. 13, Nos. 1-4, p. 13, the writer made a statement implying that the apparent geocentric daily motion of most comets hardly ever exceeds one degree unless the object is exceptionally near the earth. Although the daily motion depends on the object's distance from the earth, it is not proportional to this distance alone. In this present analysis from a purely theoretical standpoint, use is made of an algebraic expression of what is known as Lambert's Theorem. This theorem states that when the apparent geocentric path of a comet (or planet) is convex toward the sun (convexity in the direction of the shortest angular distance between the sun and the object at any date when the object is describing the convex arc), the heliocentric distance of the object is greater than the heliocentric distance of the earth; when the apparent path is concave (in the same sense of direction as for convexity), the heliocentric distance of the object is less than that of the earth.

Herget[1] develops the following expression of Lambert's Theorem from geometric and dynamic considerations of the problem using vectoral methods. Herget's result is:

$$KV^2p = (1/r^3-1/R^3)(R \sin F) \qquad (1),$$

where r is the heliocentric distance of the object, R is the heliocentric distance of the earth (or geocentric distance of the sun), F is the angular distance between the position of the sun and the great circle described by the tangent to the apparent path at the time when the object occupied the position coincident with the point of tangency, K is the geodesic curvature of the apparent path and is determined by the elements of the object's orbit with reference to the position and orbit of the earth during the time of observation (K could also be described as the coefficient defining the amount of "bending" of the apparent path or the rate of motion of the great circle described by the tangent to the path where convexity requires K to be positive and concavity requires K to be negative), V is the linear speed of motion of the object along its apparent path as measured on a geocentric unit sphere, and p is the geocentric distance of the object. Since this analysis proceeds as if the object were constrained to move on the celestial sphere, the angular velocity W may be substituted for the linear velocity V provided that all distances are expressed in terms of the astronomical unit (1 A.U. = 93,000,000 miles). From the standard form of the equation, it is apparent that the angular velocity W should be expressed in terms of radians per $1/k_o$ days as is customary in some phases of orbit calculation. The k_o is known as the Gaussian constant. Thus:

$$W = \frac{Ds}{(t_n - t_o)k_o} \qquad (2),$$

where Ds is the angular distance in radians along the apparent path which the object has traveled during the interval (t_n-t_o) in days, t_n is the date of the terminal observation, and t_o is the date of the initial observation. The angular daily motion W_d is then:

$$W_d = \frac{Ds}{k_o} \qquad (3).$$

[1] The Computation of Orbits, P. Herget, published privately, pages 37-39.

Since K and V are both velocities in equation (1), it is easier to redefine K in terms of W:

$$K = NW \quad \ldots\ldots (4),$$

where N is a coefficient designated as the "Index of Curvature" that may be chosen so that any desired value of K in terms of W may be obtained. Exact values of R may be obtained for any specific date from A.E.N.A. However, for the purposes of this discussion R will be taken as 1 A.U. The value of F depends for its maximum on the angular distance between the object and the sun at the time of observation. When the direction of motion is perpendicular to the vector intersecting with the sun and the object, F is equal to the angular distance. The angular distance ϕ can be found for a given r and p from:

$$\cos \phi = \frac{p^2 - r^2 - R^2}{2rR},$$

$$\text{and if } R = 1,\ \phi = \text{arc cos } \left(\frac{p^2 - r^2 - 1}{2r}\right) \quad \ldots\ldots (5).$$

If ϕ is greater than 90°, the corresponding maximum F is:

$$\text{Max. } F = 180^\circ - \phi.$$

This result does not mean that F will always have this maximum value. More than likely it will not. It does mean that this value is an upper limit on F for any given r and p. The Index of Curvature depends to a large extent on the shape and perihelion distance of the orbit as well as on its orientation with respect to the earth. Data from past experience indicates a mean of about N = 0.10 with extremes of 0.0010 and 1.000. Greater extremes are not practical to include in this analysis. They do exist in some cases, however. These two practical extremes are given for comparison. Solving equations (1), (3), and (4) for Ds:

$$Ds \text{ (in degrees)} = 57.2958\ k_o \left[(1/Np)\ (1/r^3 - 1/R^3)\ R \sin F\right]^{1/3},$$

and if R = 1 A.U.:

$$Ds = 57.2958\ k_o \left[(1/Np)\ (1/r^3 - 1/1) \sin F\right]^{1/3} \quad \ldots\ldots (6).$$

Here F must be equal to or less than either ϕ or else $(180^\circ - \phi)$, where ϕ is found from (5). All symbols are as before; Ds is the amount of motion in degrees per day. Table 1 below has been obtained using $k_o = 0.0172021$ and expression (6). These values are valid if the motion is at right angles to the line from the object to the sun at the time of observation. Such is hardly ever the case except when the object is very close to the earth or the perihelion distance is very small. Thus it would seem that a further reduction of about ½ would give a good average or mean value. Even then, it may be seen that the angular daily motion of comets may, and many times does, exceed one degree.

Table 1. Cometary Daily Motion In Degrees

Object Distance:		Curvature:		
Heliocentric	Geocentric	N=0.0010	N=0.10*	N=1.0
2.0 A.U.	1.1 A.U.	5°5	1°20	0°550
	2.0	7.4	1.58	.739
0.3	0.8	30.4	6.56	3.037
	1.0	31.0	6.70	3.100
	1.2	26.7	5.78	2.670
1.1	0.2	5.8	1.25	.578
	1.0	5.8	1.26	.579

*This value is about the usual curvature so these are about the best values to use as examples of normal cometary motion limits.

SOME RECENT WORK ON THE REESE HYPOTHESIS OF SOUTH EQUATORIAL BELT DISTURBANCES ON JUPITER

By: Walter H. Haas

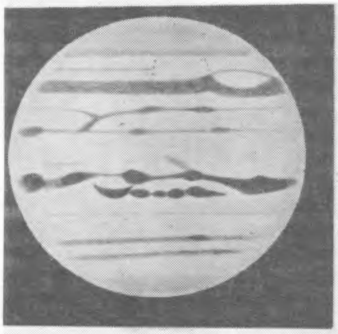
(Based in part on a paper contributed by Takeshi Sato to the Fifth A.L.P.O. Convention at Denver, Colorado, August 28-31, 1959.)

There is no more interesting object for the ordinary amateur to study with the average amateur telescope than the Giant Planet Jupiter, where the ever-changing and still quite unpredictable pattern of belts and zones becomes a fascinating panorama to the attentive observer equipped with as little as three or four inches of aperture. Nor is there any more valuable observational project for the ordinary amateur than the recording of central meridian transits of features at the visible surface of Jupiter. The method and its singularly rewarding results have been described in detail elsewhere.[1] Among the more striking Jovian phenomena are occasional major outbreaks of great activity in the double South Equatorial Belt. These S.E.B. Disturbances are characterized by a notable darkening of the South Equatorial Belt, a transformation of the Red Spot into the Red Spot Hollow, and the activity of three "currents" in the S.E.B.: one for features between the belt components, one for spots moving in rapidly increasing longitude in System II along the south component of the S.E.B., and the third for spots moving in rapidly decreasing longitude (II) along the north component.[2]

Mr. Elmer J. Reese has given an excellent description of the representative and well-observed S.E.B. Disturbance of 1958.[2] Each major S.E.B. Disturbance typically begins with a dark spot or column between the S.E.B. components. Mr. Reese has pointed out that the positions of these initial outbreaks are compatible with the concept of a constant rotation period, which may be regarded as that of an underlying "solid nucleus" of Jupiter.[1,3] The residuals in longitude between observation and theory are, however, perhaps a little too large for Reese's ingenious proposal to be completely acceptable; nor does it seem possible to require only one subsurface "volcano" as the source of all S.E.B. Disturbances. With this general background we proceed to the following slightly edited version of Mr. Sato's paper:

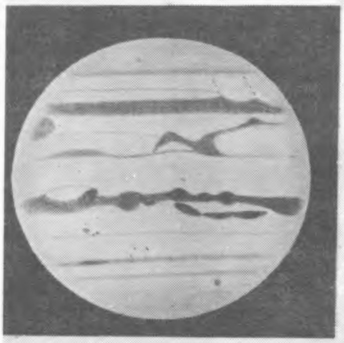
"This paper is a brief description of the great S.E.B. Disturbance of 1958 and a short discussion of E. J. Reese's rotation periods of Jupiter's solid nucleus as related to the Disturbance. The first part of the paper is based upon about 200 drawings and numerous notes by K. Komoda, the writer, and some other Japanese observers. Telescopes used were from three to eight inches in aperture, and most of them were reflectors. Times and dates here are all by Universal Time.

"Though both components of the South Equatorial Belt were very faint during the early months of the 1957-58 apparition, a major Disturbance had begun its activity by April 7, 1958, when Komoda detected a dark spot on the north component of the belt at longitude (II) 40°. (The Disturbance was first observed in the United States on March 30.) The belt rapidly became dark and conspicuous. Numerous dark spots continually emanated from the place of the initial outbreak, rapidly moving outward in the direction of increasing longitude along the south component of the belt and in the opposite direction along the north component. These two branches of the Disturbance began to pass one another at about 200° (II) on or near May 17 (Figure 15). The branch of the Disturbance between the S.E.B. components was practically stationary in System II at its following end but somewhat slowly developed in the direction of decreasing longitude at its preceding end, and the preceding end presumably reached the following end a few days after August 20, 1958 (Figures 12, 13, and 14). The writer found a strongly bluish color in the disturbed portion of the belt, while the undisturbed portion was too faint to reveal its color. When the S.E.B. Disturbance was developing, the components of the belt were observed to bend in a curious manner (Figures 12, 13, 14, 16, and especially Figure 17); and some very large dark spots were observed on the belt.

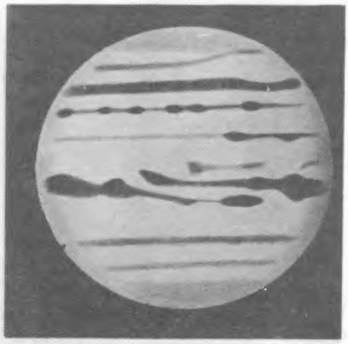


Apr. 14, 1958. $15^h 25^m$ U. T.
$CM_1 = 99^o$, $CM_2 = 51^o$
6" refl. 224X, 192X, S=8→4 or 5, T=5.
FIGURE 12

Apr. 19, 1958. $14^h 05^m$ U. T.
$CM_1 = 119^o$, $CM_2 = 35^o$
6" refl. 224X, S=6-8, T=3-4.
FIGURE 13

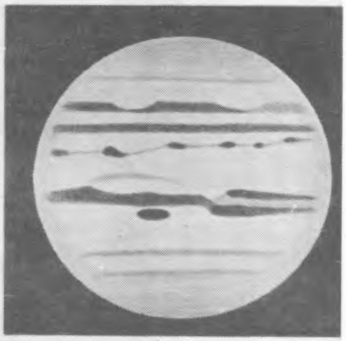


Apr. 21, 1958. $15^h 12^m$ U. T.
$CM_1 = 116^o$, $CM_2 = 16^o$
6" refl. 192X, S=3-4(5), T=3-4
FIGURE 14



May 26, 1958. $12^h 55^m$ U. T.
$CM_1 = 162^o$, $CM_2 = 155^o$
6" refl. 192X, S=5, T=4.
FIGURE 15

June 13, 1958. $12^h 25^m$ U. T.
$CM_1 = 105^o$, $CM_2 = 322^o$
6" refl. 224X, 192X, S=4-5, T=3-4.
FIGURE 16



July 6, 1958. $12^h 27^m$ U. T.
$CM_1 = 136^o$, $CM_2 = 177^o$
6" refl. 192X, S=3, T=4.
FIGURE 17

Drawings of Jupiter by Takeshi Sato at Hiroshima, Japan in 1958

"The Great Red Spot, which had been very conspicuous since the autumn of 1956, began to fade on, or a few days before, June 13 and rapidly changed its aspect from Spot to Bay or Hollow (Figure 16). It is noteworthy that the leading spot of the south branch of the Disturbance presumably reached the preceding end of the indistinct Red Spot Bay on about June 13.

"As for Mr. Reese's rotation periods, the writer found that the longitude of the initial outbreak of the 1958 Disturbance, which was about 50° (II) on about March 17 according to Reese's extrapolation,[4] did not agree at all with either of Reese's two hypothetical volcanoes on Jupiter's solid surface with their identical rotation period of 9 hrs., 55 mins., 42.66 secs.; but the writer found its position very close to that of a volcano with Reese's shorter rotation period of 9 hrs., 54 mins., 52.54 secs., a period which Reese and others have thought less acceptable. We know that the longitude of the initial outbreat of the secondary Disturbance of 1943 (Reese's 4a) and that of the 1955 Disturbance, which occurred after Reese's original paper was published and which fitted the longer period, cannot be reconciled with the shorter period. The writer found, however, that the deviation of the former Disturbance from the volcano of the shorter period was nearly equal to that of the latter Disturbance; and hence if we assume a second volcano for the shorter period, all longitudes of the initial outbreaks of known S.E.B. Disturbances feom 1919 to 1958 can be sufficiently interpreted. For the longer period three volcanoes are needed, and it is very clear that three volcanoes are less acceptable than two. The longer period does have a definite advantage, as Reese pointed out;[3] but perhaps the shorter period is as probable as the longer period. The writer affirms that we must observe future S.E.B. Disturbances more closely to settle the problem.

"Finally, the writer would like to propose an attempted correlation of radio observations of Jupiter in 1958 with the S.E.B. Disturbance. It is unreasonable to suppose that such catastrophic change may be accompanied by radio radiation?"

Mr. Reese has given his current thinking about his thesis in a letter dated July 17, 1959, here reproduced in part as follows:

"My latest figures pertaining to the S.E.B. Disturbances and the hypothetical sources follow:

LONGER PERIOD ($9^h55^m42.^s64$)

"SOURCE B (Primary): The longitude (II) of Source B on any Julian date, T, can be found by the following formula:

$$\text{Long. (II)} = 240^\circ\!.7 + 0^\circ\!.048916\ (T-2435143)$$

DISTURBANCE	LONG. (OBSERVED)	LONG. (COMPUTED)	RESIDUAL (O-C)
1928 (2425469)	128°	127°.5	+ 0°.5
1943 (2430763)	20	26.4	- 6.4
1949 (2433117)	155	141.5	+13.5
1952 (2434308)	204	199.8	+ 4.2
1955 (2435143)	229	240.7	-11.7

"SOURCE A (Secondary): Long. (II) of Source A = Long. (II) of Source B - 100°.4

1919 (2422301)	230°	232°	- 2°.0
1943B(2430783)	288	287	+ 1.0

"SOURCE C (Tertiary): Long. (II) of Source C = Long. (II) of Source B + 111°

1958 (2436289)	48°	48°	0.0

ORIGINAL SHORTER PERIOD ($9^h\ 54^m\ 52^s.60$)

"SOURCE GAMMA: Long. (II) of Source Gamma = $204^\circ - 1^\circ.171$ (T-2434308)

Disturbance	Residual (O-C)
1919	+ 3°
1928	+14
1943	-15
1949	0
1952	0
1958	+ 4

"SOURCE DELTA: Long. (II) of Source Delta = Long. (II) of Source Gamma - 79°

1943 B	- 5°
1955	+ 1

REVISED SHORTER PERIOD ($9^h\ 54^m\ 52^s.74$)

"SOURCE E: Lóng. (II) of Source E = $204^\circ - 1^\circ.1676$ (T-2434308)

Disturbance	Residual (O-C)
1943	- 3°
1949	+ 4
1952	0
1958	- 3

"SOURCE F: Long. (II) of Source F = Long. (II) of Source E + 44°

1901 (STD)	- 1°
1919	0
1928	0

"SOURCE D: Long. (II) of Source D = Long. (II) of Source E - 77°

1943 B	+ 5°
1955	- 4

"At the moment my hopes for the theory still rest on the longer period sources. The shorter period sources are beset with the formidable difficulty of explaining why the seat of each Disturbance remains nearly stationary in System II during its observed lifetime. Although the revised shorter period reduces the residuals to insignificance, it strikes me as being too much of an artifice. The next outbreak of a major Disturbance in the SEB should clarify the situation considerably and bring us nearer to the truth.

"Some time ago (May, 1958) I suggested to Mr. B. M. Peek a way in which the behavior of each major Disturbance in the SEB might be reconciled with the shorter period sources. When a major eruption occurs, a huge mass of gas is expelled. Most of this mass of gas, instead of rising directly to the top of the visible cloud layers, is detained for some time in a stable intermediate layer where its rotation period is lengthened to $9^h 55^m 42^s.64$ (the longer period) and finally reaches the surface in a series of smaller masses. This happy but highly improbable combination of the shorter and longer periods could account for almost every major and minor Disturbance ever observed in the SEB and STrZ. For instance the STrZD of September, 1955 (2435370) at Long. (II) 245° would be the belated arrival at the surface of the final portion of the mass of gas erupted from the solid nucleus at the time of the outbreak of the major SEB Disturbance of February, 1955. A residual of only +5° would result. This is all pure fancy. Mr. Peek is of the opinion that at the present time it is unwise to extend the theory to cover the STrZ Disturbances. I would like to feed all the observed data to a modern electronic brain and let it churn it up for awhile!"

Obviously future observations of SEB Disturbances must decide between the "longer" and "shorter" periods and even whether the whole theory is more than a mathematical curiosity. What is chiefly needed are accurate observations of the longitude of each initial outbreak, which in practice means an effective patrol of the Jovian surface on a worldwide basis since the time of such an outbreak cannot be foreseen. This need is underscored by the fact that Mr. W. E. Fox has recently expressed the opinion that an SEB Disturbance probably occurred unobserved in 1946.[5] One should even try for effective coverage as close as possible to Jupiter's conjunctions with the sun to reduce the risk of missing a Disturbance occurring while the planet is lost from view near the sun. A larger number of observers will permit greater accuracy in deducing the important longitude of the initial outbreak. The method of visual central meridian transits will supply longitudes quite satisfactory for the present study.

Continuous coverage of the Jovian panorama requires observers scattered over the whole world. It is hence very gratifying to note the interest in systematic Jovian studies shown by Mr. Sato and his countrymen. The work of the Jupiter Section of the British Astronomical Association has long been justly famous, and the A.L.P.O. enrolls a number of capable observers of the Giant Planet in the United States. Thus we may be closer than before to an effective international patrol of Jupiter, but many more observers in many different countries are needed. The help of all interested amateur students of Jupiter will be extremely welcome.

Referring to the possible unnoticed SEB Disturbance of 1946,[5] Mr. Reese points out that an apparent relation among the intensity of the Red Spot, the intensity of the South Equatorial Belt, and the occurrence of SEB Disturbances <u>also requires a Disturbance in 1946</u>.[6] Should Mr. Fox's suspicion be verified, what at first seemed like a weakness in the relation suggested by Reese may become one of its chief supports.

References

1. B. M. Peek, <u>The Planet Jupiter</u>, MacMillan Company, 1958.

2. Elmer J. Reese, "The 1957-58 Apparition of Jupiter," <u>The Strolling Astronomer</u>, Vol. 13, Nos. 5-8, p. 58, 1959.

3. Elmer J. Reese, "A Possible Clue to the Rotation Period of the Solid Nucleus of Jupiter," <u>Journal of the British Astronomical Association</u>, Vol. 63, No. 6, pp. 219-221, 1953.

4. <u>The Strolling Astronomer</u>, Vol. 12, Nos. 1-3, p. 36, 1958.

5. <u>Journal of the British Astronomical Association</u>, Vol. 69, p. 256, 1959.

6. <u>The Strolling Astronomer</u>, Vol. 10, graph on p. 114 and text on p. 115, second paragraph, 1956.

BOOK REVIEWS

<u>Mars Revisited</u>, by Donald L. Cyr. Dorrance and Co., Inc., Philadelphia, 1959, $3.00.

Reviewed by J. Russell Smith

The space age has brought about a new interest in lunar and planetary conditions and the possibility of life on the planets. This book presents many ideas expressed in the author's booklet, <u>Life on Mars</u>, which appeared in 1944. However, this new book presents a "Marsitron" hypothesis, and the ideas in both books are based on Lowell's observations of the mysterious planet.

Mr. Cyr, in Life on Mars, assumed the lines on Mars to be canals bounded by vegetation; but in this new work he assumes the lines to be only vegetation. The unknown cause of the lines is the "Marsitron" which is assumed to be a mobile species that grazes on Martian plants (probably lichens). The oases of Mars are considered as impact craters which furnish "homes" for the species, and the canals exist as migratory-fertility paths (of vegetation) caused by the action of these mobile animal species. He assumes that the "craters" are surrounded by green patches of vegetation which exist as a result of the fertility by-products of the "Marsitrons."

As a student and observer of Mars for the past 25 years, I found the "Marsitron" hypothesis (imaginative speculation) interesting reading, and I am of the opinion that you will find it interesting reading also.

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The Sky Observer's Guide, by Newton Mayall, Margaret Mayall, and Jerome Wyckoff. Illustrated by John Polgreen. Golden Press, New York, 1959. 125 pages. Price $2.95.

Reviewed by Walter H. Haas

This book is heartily recommended to the beginning amateur astronomer who wishes to become an observer of the sky. It would be a splendid present for any earnest junior. The authors will scarcely need to be introduced to the readers of this periodical, and Mr. Polgreen has belonged to the A.L.P.O. for a number of years. The illustrations are very numerous and add considerably to the text. In a few figures the reviewer would feel that color has been somewhat overdone, as when solar eclipse-tracks are plotted against a background of purple continents and orange oceans on page 51.

The book includes a remarkable amount of "practical" information for the amateur observer on a wide variety of subjects: light-grasp and magnifying power of telescopes (page 15), cleaning optical surfaces (pp. 111-112), amateur observing groups and reference books and magazines (p. 113), the use of setting circles (pp. 34-36), drawing techniques (pp. 92-94), projecting the sun's image on a screen (pp. 50-51), etc. The photographs used are in part from large professional observatories, but there are also included photographs and drawings by skillful amateurs like Clarence P. Custer (p. 95) and David Meisel (p. 73). There is a two-page index.

The beginning observer is urged to acquire Sky Observer's Guide for his library.

OBSERVATIONS AND COMMENTS

Penumbral Lunar Eclipse of September 16-17, 1959. The circumstances of this eclipse were given on page 650 of Sky and Telescope for September, 1959, though "Moon leaves umbra" should there have read "Moon leaves penumbra." Mr. Phillip Budine with a 2.4-inch Unitron refractor observed the southwest limb of the moon to be dusky gray in color from 1^h10^m to 1^h20^m, U.T. on September 17, when the moon was very close to the umbra. A lunar limb darkening was also observed by Mr. J. Russell Smith.

Cleft System near Grimaldi. Lunar observers are invited to study Figure 18, a sketch by Mr. Charles M. Cyrus of the system of clefts just west of the great plain Grimaldi. Mr. Cyrus' sketch may be compared with Mr. Alika K. Herring's article and accompanying chart, "A New Lunar Cleft System," The Strolling Astronomer, Vol. 12, pp. 82-83, 1958. Others are encouraged to observe this system of clefts and to submit sketches. The favorable colongitude is from about 67° to 73°, thus under low morning lighting soon after Grimaldi is illuminated.

Plato. Mr. Patrick McIntosh of Robinson, Illinois, has reported some observations of this lunar walled plain carried on at Harvard College

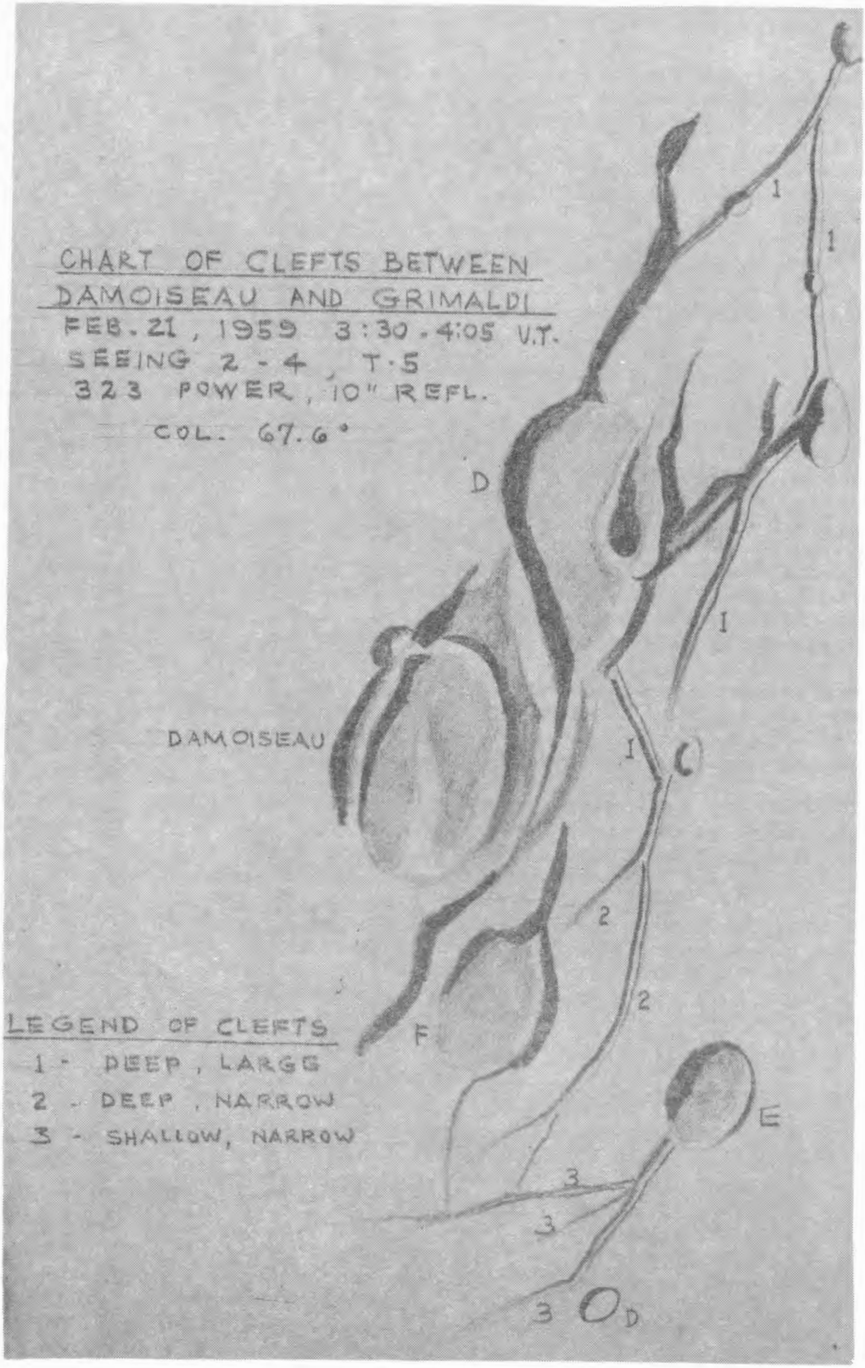

Figure 18. Drawing of system of clefts between Damoiseau and Grimaldi by Charles M. Cyrus with a 10-inch reflector. Lunar south at top, lunar east at right.

Figure 19. Drawing of Plato by Patrick McIntosh on January 18, 1959 with 7.5-inch Harvard College Observatory Clark refractor at 400X. Seeing 3-5, some small clouds. Rim drawn at 3^h25^m-3^h45^m, U.T., shadow at 3^h50^m- 3^h58^m, and craterlets at 4^h0^m-4^h5^m. Colongitude about 14°. Arrow 1 points to peak casting longest shadow. Arrow 2 points to landslip on east wall.

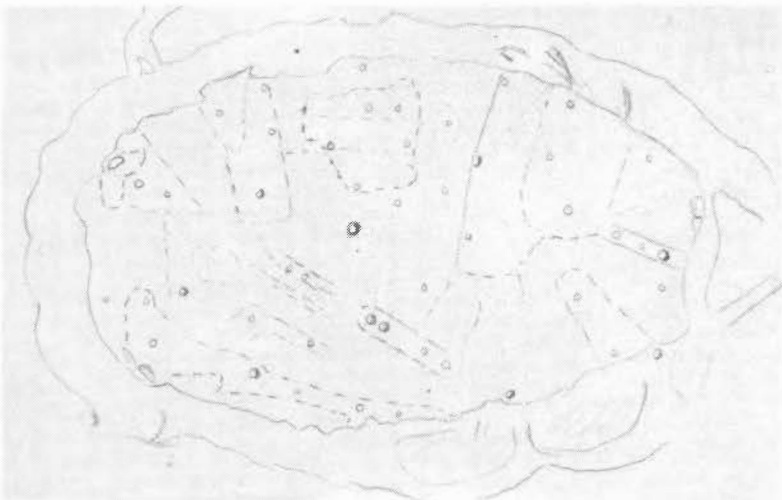

Figure 20. Tentative chart of floor of Plato in 1958-59 by Patrick McIntosh. Based on personal observations with an 8-inch reflector and a Harvard College Observatory 7.5-inch refractor.

Observatory, where he is a student. He had previously studied Plato with an 8-inch reflector of apparently excellent quality. We quote part of a letter from Mr. McIntosh on June 10, 1959; we think that the ideas and techniques mentioned can be of value to any serious lunar observer.

"To be as accurate as possible with positions of detail, I have taken special care to have all rim detail as complete and as correctly proportioned and positioned as visual work permits. By drawing an imaginary line through each spot or crater on the floor and noticing what rim detail lies on this line at either end where it touches the rim, I position the spots with fair accuracy. More than one or two checks using different rim details are made to insure accuracy. To be sure that I had some detail plotted precisely enough for use as reference points, I enlarged the Mount Wilson photograph published in Sky and Telescope for April, 1955, into a chart, drawing the rim and six shadow-holding craterlets from this photo. On this chart I have added only details I have verified or have found at Harvard; and the result is a chart (Figure 20) somewhat different from my previous one and which now agrees more closely with Alika Herring's chart (Str. A., Vol. 11, p. 96, 1957). I do not believe that all spot positions are entirely accurate, nor do I believe that every spot capable of being seen is present on the chart. I had no nights of really good seeing during my observing in Cambridge, so I never saw the same wealth of detail as on some crisp Illinois nights.

"The major changes in my new map are in the splotch pattern and in the addition of a landslip on the east rim (Figure 19). I was particularly impressed with the complexity of the splotch pattern. Previously I had drawn each light area as being of the same intensity as the others and being of uniform shading. Such is not the case, and in particular the sector in the southeast quadrant of the floor is composed of two or three degrees of shading. The patterns of the western half of the crater are ill-defined as a whole, but in the eastern half the sector is bounded by sharp lines of intensity differences. The short streak extending from the east rim to the sector and containing a crater pit is very sharply defined. Also the entire western edge of the sector is sharp. I have found that this latter boundary coincides with the edge of a shallow valley extending parallel to this edge along its entire length (Figure 19). I suspect that all light areas are the tops of low swells in the floor, the brighter being the higher.

"My present objective in observing Plato is not to attempt a complete sketch each time but to verify and correct all positions of detail thus far mapped, to record additional spots when possible, to fill in details on the intricate splotch pattern, to correlate the splotch pattern with the contour of the floor as seen under low solar illumination, and to measure the heights of mountains on the rim as indicated by their shadows. These latter observations will be made at intervals of every few minutes while sunrise on Plato is occurring. If the computed heights seem to vary with each shadow measurement, the contour of the floor will be responsible; and a contour map can gradually be formed. This project was suggested to me by Dr. Joseph Ashbrook."

Mr. Alika Herring expresses his good opinion of the quality of Mr. McIntosh's work and explains that he has not drawn much structure in the bright streaks on the Plato floor simply because this detail is extremely complex. He doubts that these white streaks are higher places on the floor. He regards W. H. Peckering's 1892 chart of Plato as the best of those constructed so far. Mr. Herring has discontinued his own studies of Plato until he is able to undertake a micrometric survey of the sizes and positions of the floor craterlets and other markings.

Occultation of Regulus by Venus on July 7, 1959. Mr. Ronaldo R. de Freitas Mourão at Rio de Janeiro, Brazil has reported observing this phenomenon as follows: "In spite of the unfavorable atmospheric conditions on July 7, I was able to observe the occultation emersion of Regulus. Emersion was timed at $14^h32^m 18^s.5$, U.T. The eye-and-ear method was used. Clock corrections were determined by comparison against the Observatory Standard Quartz Clock for the International Time Service. According to my micrometric measures the position angle for the emersion was $274^\circ.25$."

Moon's Averted Hemisphere Photograph. As is now well known, the Russian Lunik III took a photograph of the lunar averted hemisphere in October, 1959. We have not yet seen a copy of this photograph appreciably more satisfactory than those which have so far appeared in the popular press. Of course, the original photograph had there been reproduced several times with consequent loss of detail. Attention is invited to the December, 1959 issue of Sky and Telescope, front cover and pp. 72-73, where Ernst Both interprets the detail represented.

Linné. Takeshi Sato in Japan has contributed drawings of the crater pit within the white area made on Oct. 2 & 3, 1957 at colongitudes $14^\circ.1$ and $26^\circ.0$ respectively, 6-inch reflector at 336X and 224X. The west side of the pit was dark, probably being a shadow. The apparent east inner wall and the area just west of the crater pit were bright. The Linné craterlet is relatively very deep, and it would be of value to determine how long it holds morning shadow; large apertures of 12 ins. and more will be necessary to obtain adequate resolving power.

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