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ASTRONOMISCHE NACHRICHTEN.

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Band 142. 22.

The Rotation Period of Venus.

By *Percival Lowell.*

[With three plates.]

As the rotation period of the planet Venus has hitherto been doubtful, I communicate to the Astr. Nachrichten the determination of that period which I have just made. Besides being a matter of some interest in itself, the determination is of still more interest in its results. For upon the rotation period depends the whole physical constitution of the planet.

My observations began on August 24. They were made with the 24 inch refractor of this observatory and with one or other of two eye-pieces: a comet-seeker, a negative eye-piece magnifying about 140 diameters; and a positive eye-piece magnifying about 300 diameters, used on the micrometer. Drawings were made with both eye-pieces; the former being the better for purposes of detection, the latter being chiefly useful in measuring diameters and taking position angles of the markings. Any higher power I found impracticable.

The markings proved to be surprisingly distinct; in the matter of contrast, as accentuated, in good seeing, as the markings on the Moon and owing to their character much easier to draw; in the matter of contour, perfectly defined throughout, their edges being well marked and their surfaces well differentiated in tone from one another, some being much darker than others. They are rather lines than spots; as will be seen from the accompanying drawings by me and my assistants Mr. *Drew* and Mr. *Leonard.* A large number of them, but by no means all, radiate like spokes from a certain centre. In spite of this curious system there is about them nothing of the artificiality observable in the lines of Mars. They have the look of being purely natural.

These markings prove to be not only permanent but permanently visible. Nothing but our own air, and it must needs be bad at that, suffices to obliterate them. Unless the seeing is very poor, they are always seen and always seen in the same place.

So evident are the markings that it has been possible to get position angles of them, of which I have already taken some and mean to take more.

From the drawings it will appear that they disclose the rotation period unmistakably. As the most forthright instance I may mention the four drawings made on Oct. 15 covering between them a period of five hours. Their absolute resemblance in all their details during this long interval shows that no period for the rotation approaching 24 hours is possible, for in the interval the planet must, on that supposition, have rotated over 75 degrees and the central markings have travelled, therefore, about five-eighths of their apparent way across the disk. In the next place comparison of all the drawings shows that the rotation is such as to keep the markings always in the same position with regard to the terminator. Now in the case of a planet like Venus which revolves practically in a circle this is possible and only possible when the rotation period and the orbital one coincide.

To show how exact this accordance of the markings to the terminator should be, we may note that in passing from apse to apse Venus would librate in longitude only 47′ — a quantity too small for the consequent shift to be perceptible. Observation shows just such a theoretic accordance. The planet has now been under observation here (October 20) nearly two months or a fifth of her orbital period and during this time no deviation has been perceived from perfect isochronism of the rotation and the orbital periods.

The observations also disclose certain physical characteristics of the planet.

First: the variability of the markings shows that they are not obscured at any time by clouds. In other words there are no clouds upon the planet.

Next: the intense lustre of the disk is shared by all the markings. It is as if a bright veil of some sort were drawn over the whole disk. Compared with Mercury and his markings the effect is striking. This veil can hardly be anything but atmosphere.

The presence of atmosphere is further demonstrated by the measures of the diameters as compared with those of Mercury. They reveal a twilight arc as the Martian ones do — while the Mercurial do not.

Third: there appears to be no sign of water or of vegetation upon the planet. This is shown by the absence of color in any part of the disk. The disk is simply a design in black and white over which is drawn a brilliant straw-color veil. Compared with the pronounced and beautiful tints of Mars the white, the blue green and reddish-yellow, of that other world — Venus is a very drab-like thing.

Furthermore there is no evidence of any polar caps. I thought at one time to see something of the kind but it had nothing of the unmistakableness of the Martian polar caps and the effect has never been repeated.

Lastly: the relative visibility of some of the markings changes with their position with regard to the observer. For instance Somnus regio, which was almost invisible when in the centre of the disk, has grown more conspicuous as it has approached the limb. Anteros regio and Adonis regio have similarly become less salient on nearing the central meridian. Other markings under like conditions of position and illumination have not done so, but have remained as evident in the one aspect as in the other or, in Hermione regio, have been less conspicuous on nearing the limb. As of two markings occupying the same part of the disk, Hermione regio and Somnus regio for example, the one will change in one way, the other in an opposite manner, the changes cannot be a matter of obscuration. Secondly as the position of the markings has not shifted with regard to the Sun, the change cannot be intrinsic. It is due probably to a difference in the character of the rock or soil, greater or less roughness for example, in one region than in the other. That in these markings we are looking down on a bare desert-like surface is what the observations imply.

Lowell Observatory, 1896 Oct. 21.

Percival Lowell.

Zusatz. Die von Herrn *P. Lowell* eingesandten Zeichnungen, zu welchen nachträglich noch einige spätere, bis zum 9. November reichende hinzugetreten sind, sind zum grösseren Theil auf den beiliegenden Tafeln wiedergegeben.

Die nicht reproducirten Zeichnungen

Percival Lowell: Sept. 29 $3^h 30^m$ about, Sept. 29 $5^h 12^m$, Oct. 1 $4^h - 4^h 5^m$, Oct. 1 $4^h 16^m - 21^m$, Oct. 3 $2^h 27^m$ to 37^m, Oct. 3 $2^h 45^m - 51^m$, Oct. 5 $1^h 49^m$, Oct. 5 $2^h 47^m$, Oct. 5 $4^h 58^m$, Oct. 7 $3^h 54^m$, Oct. 7 $4^h 50^m - 5^h$, Oct. 8 2^h to $2^h 2^m$, Oct. 8 $2^h 19^m - 25^m$, Oct. 8 $4^h 42^m$, Oct. 9 $1^h 59^m$ to $2^h 28^m$, Oct. 9 $2^h 48^m - 56^m$, Oct. 9 $4^h 50^m - 57^m$, Oct. 9 $5^h 3^m - 8^m$, Oct. 16 $0^h 15^m - 20^m$, Oct. 16 $5^h - 5^h 5^m$, Oct. 17 $3^h 30^m$, Oct. 19 $3^h 25^m - 34^m$, Oct. 19 $5^h 5^m$, Oct. 20 1^h, Oct. 23 $23^h 36^m - 43^m$, Oct. 25 $3^h 45^m$, Oct. 25 $4^h 2^m - 11^m$;

W. L. Leonard: Nov. 4 $4^h 50^m$, Nov. 5 $3^h 20^m - 26^m$, Nov. 7 $4^h 34^m - 40^m$, Nov. 9 $0^h 32^m - 43^m$

stehen den Lesern zur Einsicht zur Verfügung.

Kr.

Libration of Venus and Mercury.

By *Percival Lowell.*

The librations affecting Venus and Mercury are of two kinds: true libration, due to the planet's own motion; and apparent libration, due to the motion of the observer on the Earth. The first kind alone can affect the amount of visible surface presented to him since only libration with regard to the Sun can produce any alteration in the parts of the planet's surface under illumination.

True libration may take place either in longitude or latitude; the former depending upon the eccentricity of the planet's orbit, the latter upon the inclination of the pole of rotation to that orbital plane. The amount of the latter we do not yet know exactly; but from the fact that observations here show no perceptible deviation from what would be the case were the pole perpendicular to the orbital plane, any possible inclination must be small. The libration in longitude is a perfectly definite quantity and amounts in the case of Venus at its maximum, to 47′ of arc; in the case of Mercury to 23° 39′. This is the extreme limit of swaying as the planet moves from apse to apse. As in the succeeding half of the orbit the libration takes place the other way the double of these values, or 1° 34′ for Venus and 47° 18′ for Mercury give the increase of longitudes shown us on either planet. It so happens, therefore, that the amounts disclosed beyond the 180° visible without libration are related in the following easily remembered manner: 47° for Mercury and twice 47′ for Venus.

From this it is evident that we can never see appreciably more than one-half of Venus; while we see in all about five-eighths of Mercury. What is more, we have no reason for supposing, as we have in the case of the Moon, that the hidden portions are like the visible ones. For in the case of the Moon, the Sun which is the great cause of surface changes acts equally on both. This is not the case with Mercury and Venus.

Lowell Observatory, 1896 Oct. 21.

Percival Lowell.

Projections on the Terminator of Mars and Martian Meteorology.

By *A. E. Douglass.*

In this note I desire to call attention to the importance and interest attached to observations upon irregularities on the terminator of Mars by describing very briefly the observations made at the Lowell Observatory and the meteorological hypotheses which will account for them, and to mention the general conditions under which observations have already successfully been made.

In the opposition of 1894, the south pole of the planet was turned well towards us and we recorded nearly eight hundred irregularities of which some three hundred and fifty were projections. The frequent continuance of projections for several hours at the same latitude followed by an entire absence on the next night of any sign of a projection in that locality, lead us to believe that they are due to clouds forming at greatly varying altitudes, at or very near the moment of the departure of sunlight. Their form then is that of a bank whose upper surface touches the ground at the sunset line and which extends toward the night side continuously in a nearly horizontal direction, straight away from the sun, becoming higher and higher as it gets farther from the terminator. Whether, toward the outer extremity, the under surface of the cloud bank reaches the ground or not it is of course impossible to say. From certain special observations it seems probable that at very low altitudes this condensation can take place at least half-an-hour before sunset, also that occasionally clouds last over night and appear on the sunrise terminator as cloud-masses at considerable altitude and separated from the surface, as if the lower masses of vapor had been precipitated. In the special case to which I have reference apparently the same vapor mass came to the sunrise terminator on two successive mornings. On the first morning it had an altitude of fifteen miles above the surface and on the second morning was only eight miles high, had changed some ten degrees of latitude, and was more spread out in longitude. The average vertical height of the top of the sunset cloud-bank observed in the month of July and August, 1894, was 4.4 miles. Upon the sunrise terminator in the following December, January, and February, it was 3.4 miles.

Upon investigating the distribution of projections in latitude we found a very marked accumulation of them between latitudes 40° and 50° south, which it seems best at present, at least, to associate in some way with the heat-equator of the planet. The season on Mars was just before the middle of the southern summer, and on a planet which has no oceans and is largely desert the heat-equator must sway much farther from the geographical equator than on the Earth, and reach its greatest distance more promptly. It is therefore reasonable to suppose that this maximum of vapor at about latitude —43° corresponds to our equatorial rainy belt which moves north and south with the sun. The concentration of cloud at this latitude during the months of July and August, 1894, would be sufficient to cover the zone between —40° and —50° to a mean depth of 2.1 miles. The cloud masses between —60° and +50° if spread evenly over the entire zone between those latitudes would produce a mean depth of 1800 feet. The sunrise terminator was less carefully observed but its quantity was only about one-third of this.

A certain class of projections of great height and appearing to extend well beyond the true limb appeared upon the terminator in the vicinity of either cusp.

The depressions which constituted the remainder of the eight-hundred irregularities and which were usually, but not always, over the dark markings, seem best explained by attributing them to the character of the surface, that is, to its lack of reflecting power under certain conditions; the frequent absence of the depressions being due to the presence of haze in the air, or mist condensing towards nightfall from that moisture which is usually assumed to exist in greater quantity in the dark regions than in the light.

The conditions under which these observations were made, consisted in, first, an atmosphere through which the limb and terminator could be seen as distinct lines. This great number was observed through a telescope of 18 inches aperture and 315.5 inches focus and almost entirely with a ½ inch eye-piece giving a power of 617. A few were seen with a power of 420 (¾ inch eye-piece). Unless the atmosphere is sufficiently good to allow the use of a power of 500 or 600 to advantage, probably very little can be done. During the chief part of the observations the diameter of the planet was between 11″ and 17″ and the phase angle — the angle at Mars between the Earth and Sun — was 37° to 47°. When this angle was less than 37° the number of irregularities decreased very rapidly.

In the present opposition of 1896 the north pole is turned slightly towards us and we have observed a line of conspicuous projections on the southern edge of the north polar white zone, that is, in general between latitudes +40° and +50°. The polar cap may be seen as a minute spot on the southern edge of this white zone. The white zone not being the polar cap, has therefore not been explained with certainty but this appearance of projections on its southern edge indicates that aqueous vapor is present in it. It seems probable that the white zone is a region so cold that clouds can form in large quantities in the daytime but that along its northern boundry the aqueous vapor requires the actual departure of sunlight before there is sufficient cold to produce condensation.

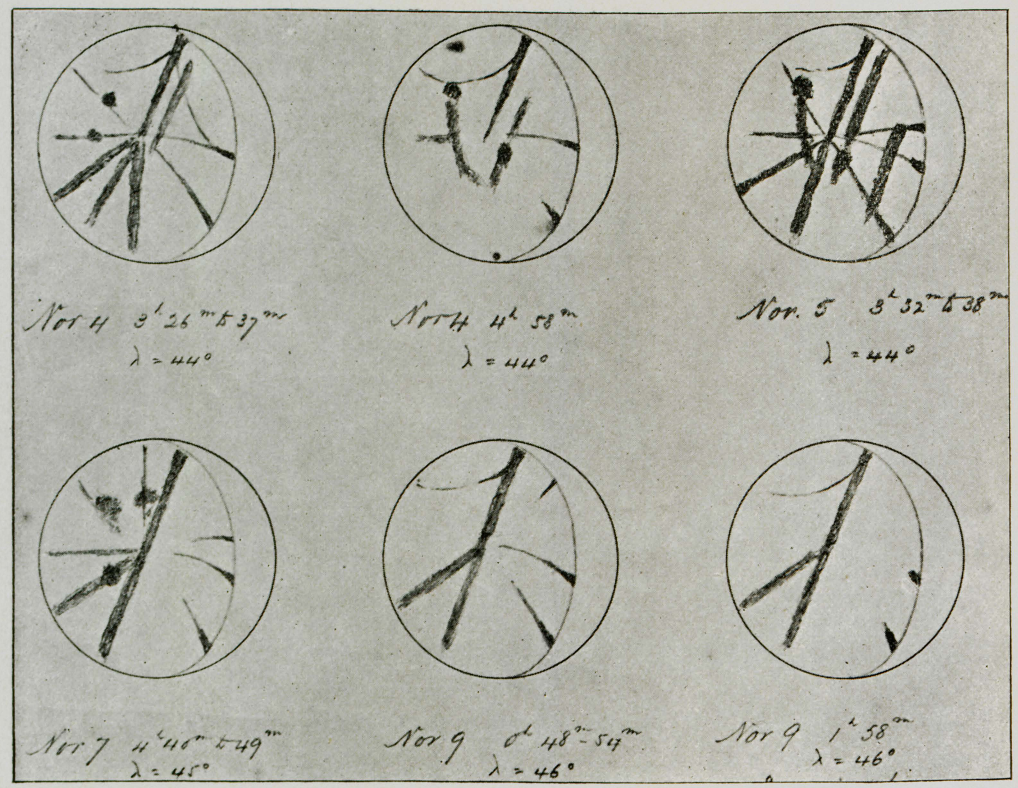
In this general view of Martian meteorology the function of convectional action seems to be to raise aqueous vapor up into the air but not by this means to produce clouds to any great extent in the daytime as on the Earth. This to some degree is what we should expect because the atmosphere on Mars decreases in density on ascent with only one-third the rapidity of our own. The strong convectional currents near the heat-equator raise the vapor which in the southern summer is derived from the melting of the south polar cap. In the late southern autumn (of the present opposition) this has not been observed to nearly so great an extent either owing to its approach to the southern cusp or because of an actual decrease in the water supply; while on the other hand we do get a cloud sheet stretching north from latitude +50° and on the southern edge of this enough moisture and yet enough heat to produce condensation and yet limit it to the time of sunset.

Such in brief is the present stage of the study of irregularities on the Martian terminator and our understanding of their significance. We hope that their importance in the investigation of meteorology upon a neighboring planet will incite all those who can spare the time to attempt something in this interesting subject.

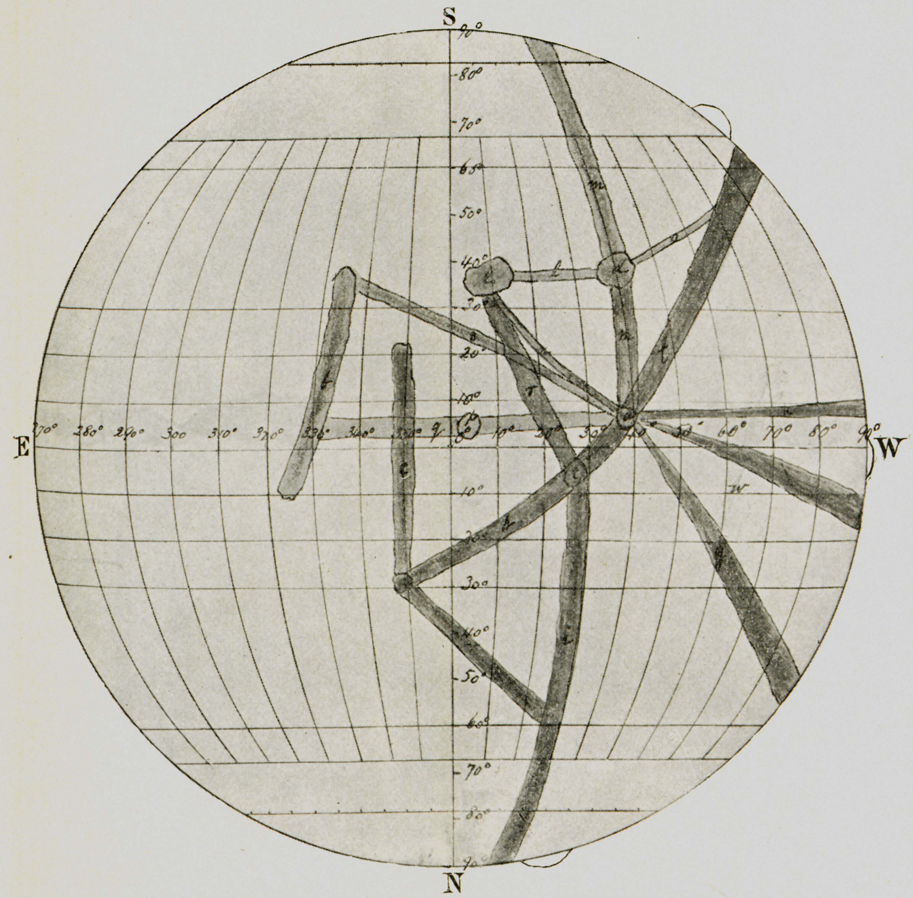
Lowell Observatory, Flagstaff, Arizona, 1896 Oct. 22.

A. E. Douglass.

Drawings by Percival Lowell.



Percival Lowell, Oct. 19, 1896. Chart of Venus.



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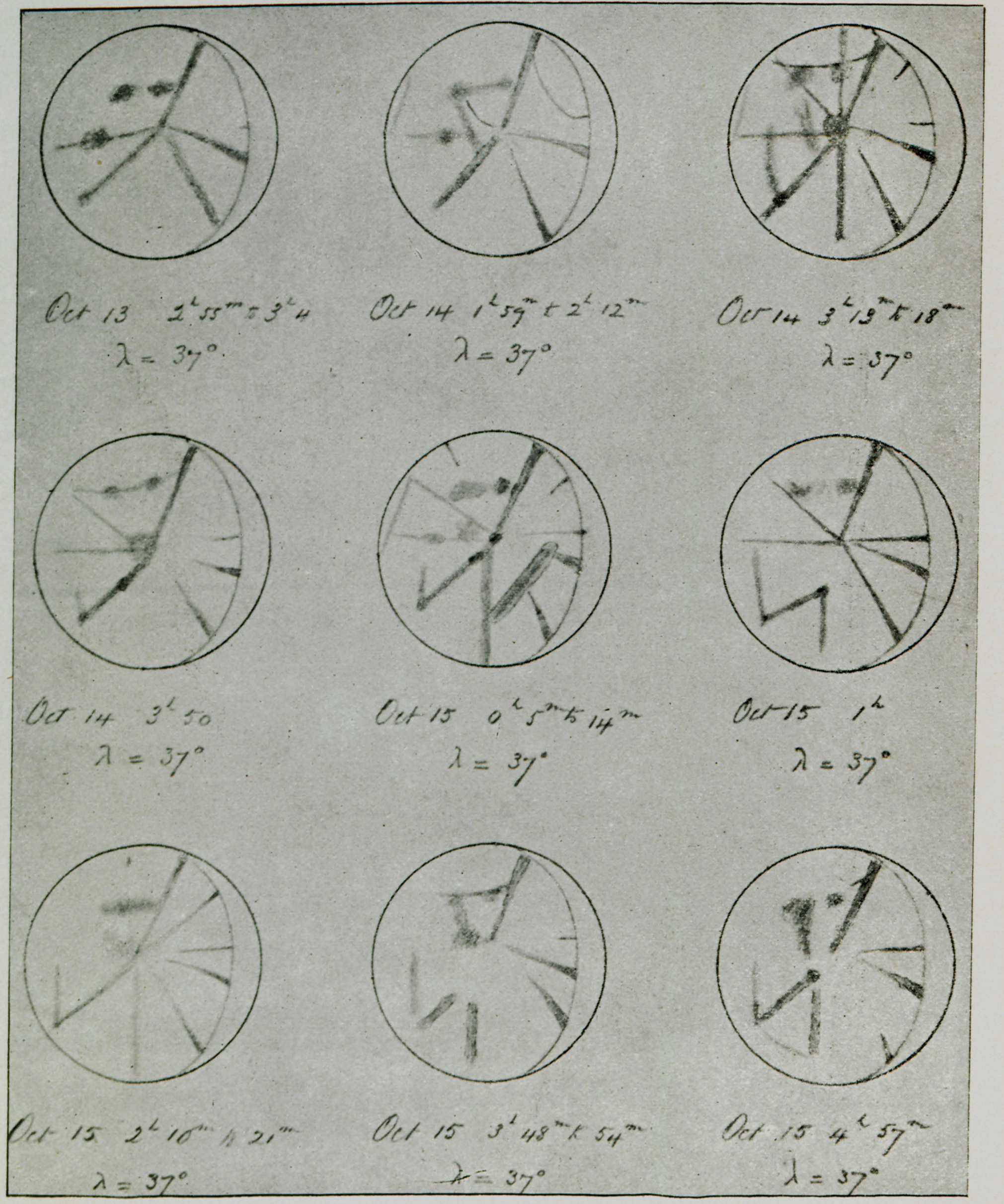
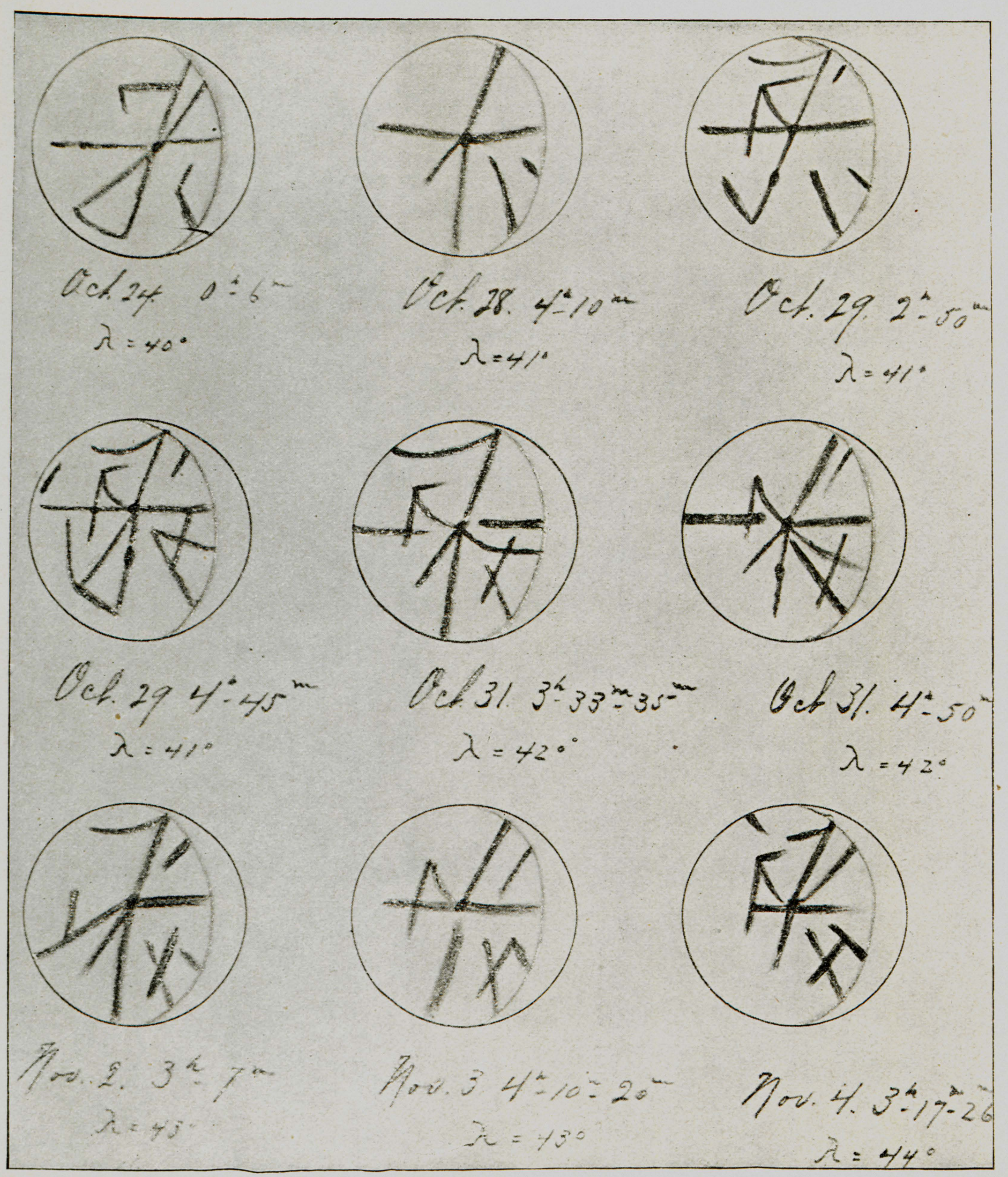
w Libentina regio

C. Schaidt, Kiel

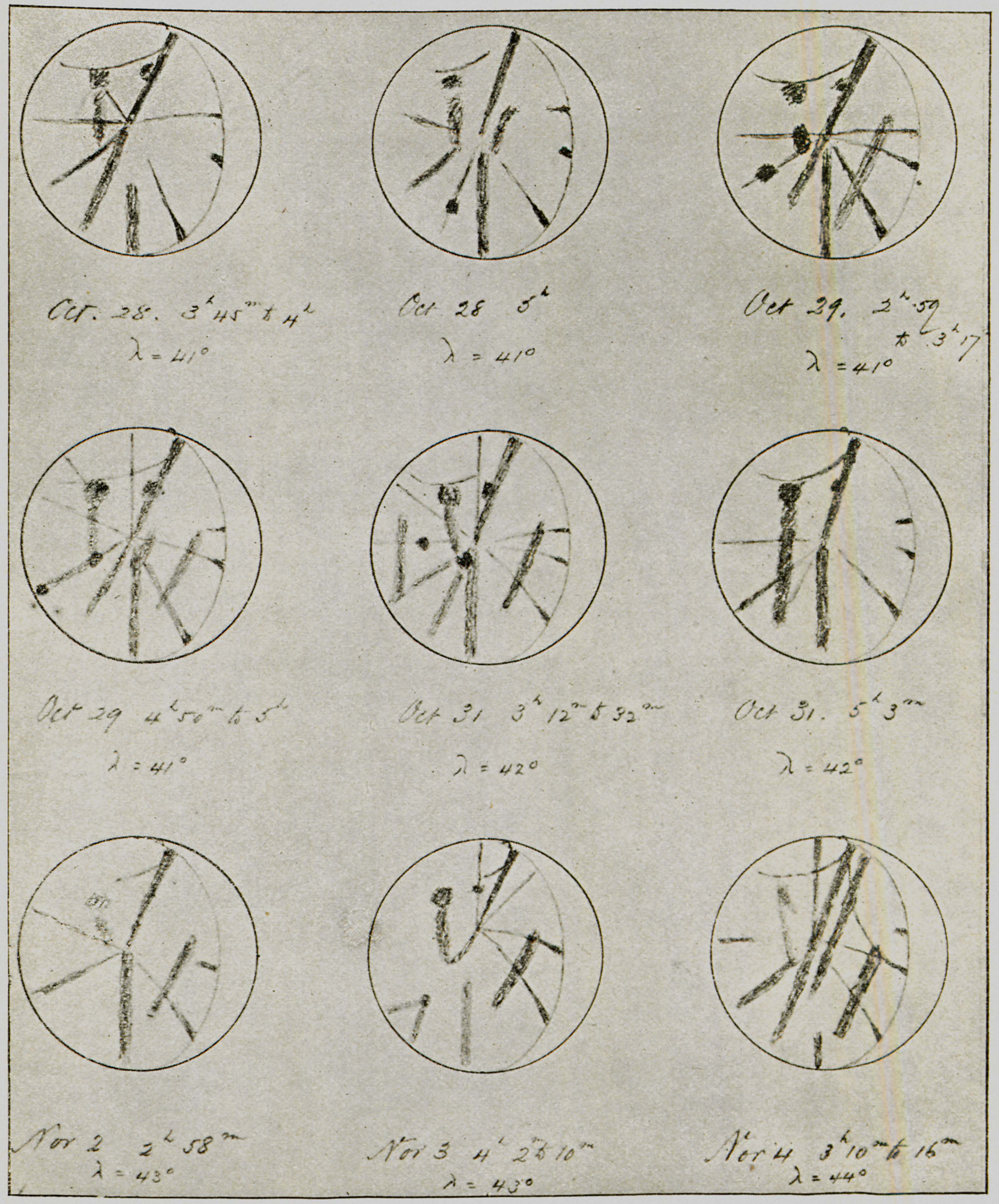
Drawings by Percival Lowell.



Drawings by W. L. Leonard

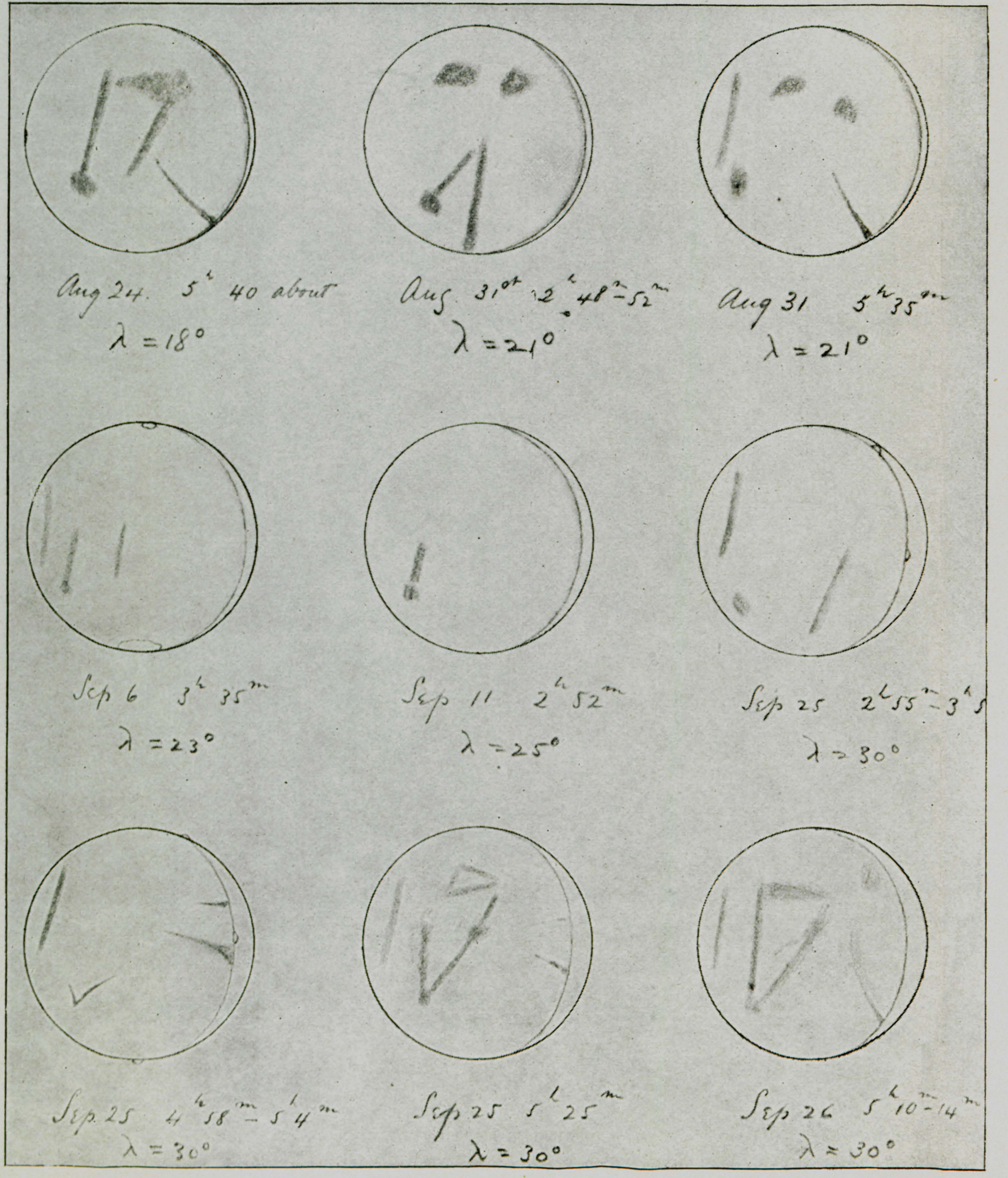


Drawings by Percival Lowell.

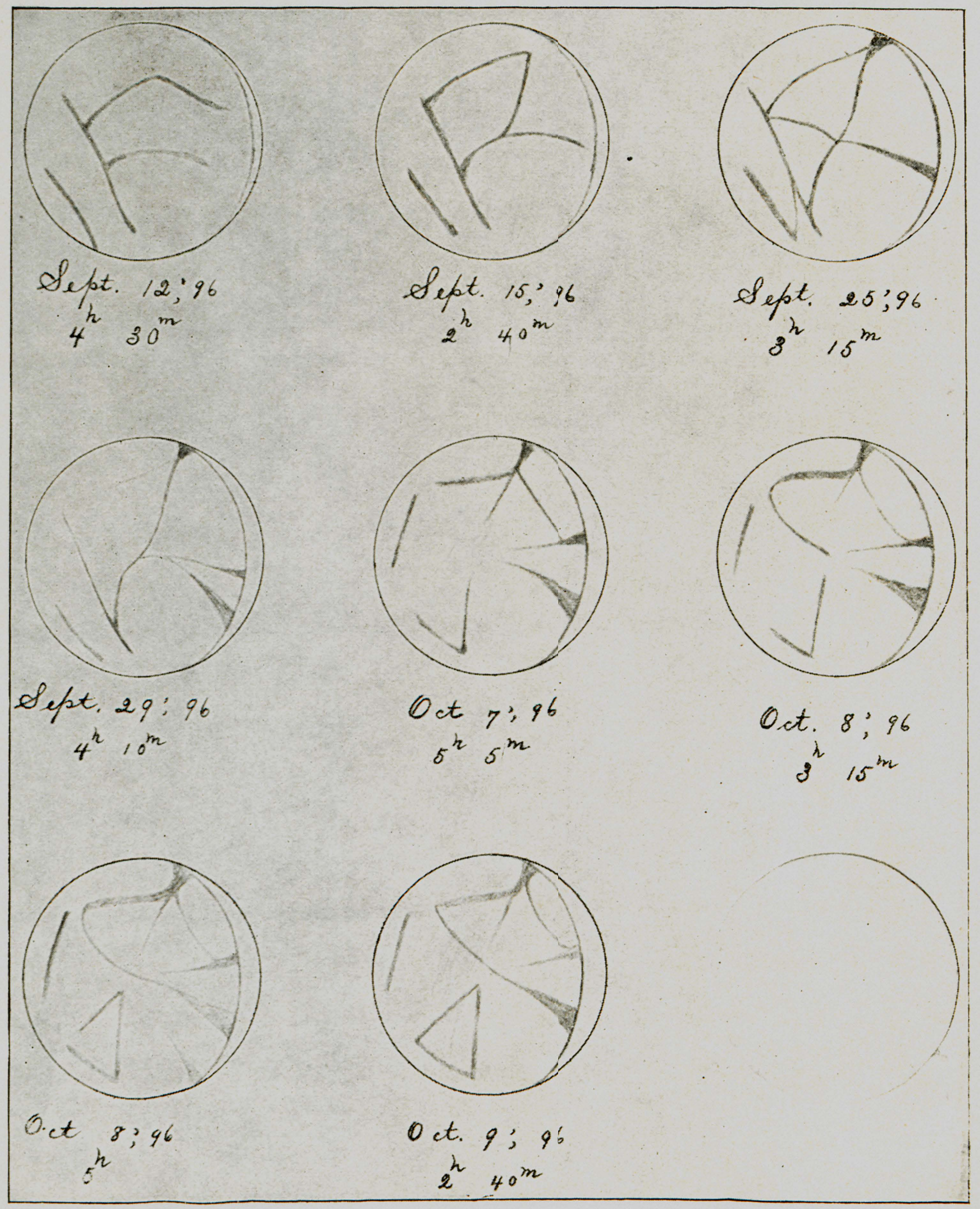


C. Schaidt, Kiel.

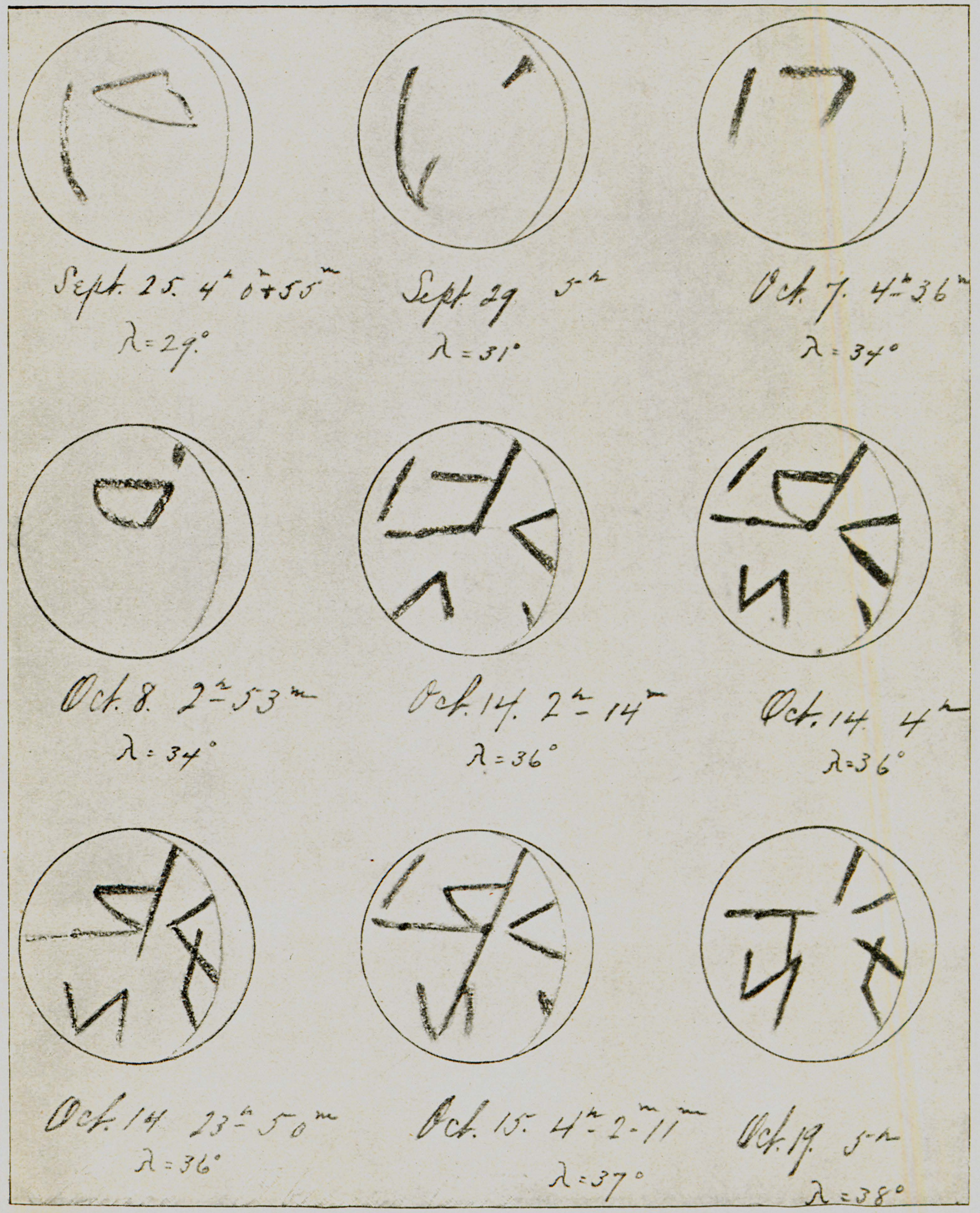
Drawings by Percival Lowell.



Drawings by D. A. Drew.



Drawings by W. L. Leonard.

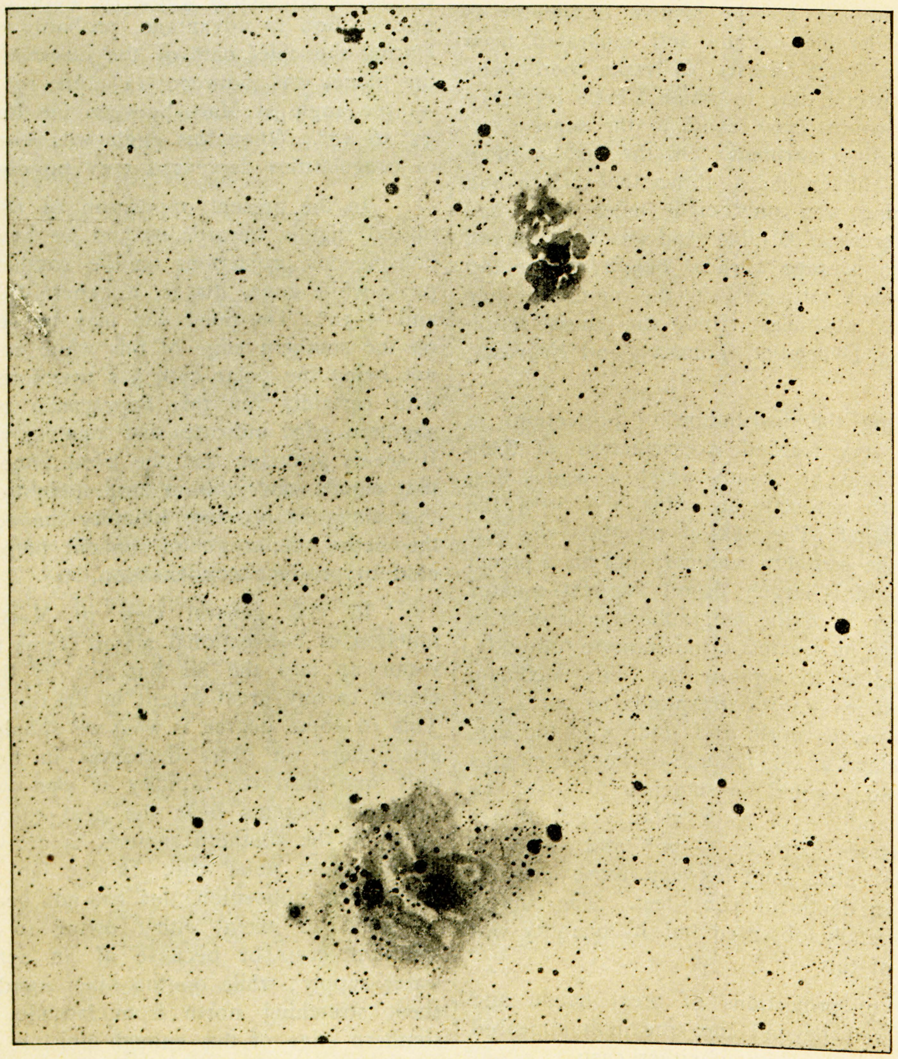


C. Schaidt, Kiel.

The Bruce Photographic Telescope.

By *Edward C. Pickering.*

The advantages of a doublet for photographing the stars were advocated by the writer in 1883 (Astr. Register XXI, 151, Observatory VI, 201) and again in 1886 (Mem. Amer. Acad. XI, 179). In the latter article (p. 207) it was urged that charts should be photographed of the same size and scale as the charts of Peters and Chacornac, that is on a scale of 6 cm to 1°, and covering a region 5° square. It was there proposed that photographs taken with the 8 inch Bache telescope should be enlarged three times. A similar plan was recommended to the Congrès Astrophotographique International in a letter dated Decb. 10, 1887 (Annexe, No. 5, p. 95). Later, it was shown in a paper presented to the National Academy at a meeting held in Washington in April, 1888, that the best results might be expected from a telescope having an aperture of 60 cm and a focal length of 343.8 cm. The same plan was recommended in a circular dated November 20, 1888, and entitled, A large Photographic Telescope. The generous liberality of Miss Catherine W. Bruce (The Bruce Photographic Telescope, June 26, 1889), permitted this experiment to be tried. The instrument was constructed by Messrs. Alvan Clark and Sons, and was mounted provisionally and tested in Cambridge. It was sent to Arequipa last winter by way of the Straits of Magellan, thus avoiding the dangers of transshipment upon the Isthmus of Panama. It arrived safely in Arequipa, was mounted successfully, and is now kept in constant use by Professor Bailey. The excellent results since attained with it are largely due to his skill and perseverance. The accompanying plate serves to illustrate the work already accomplished with this instrument. The original negative was taken on June 11, 1896, with an exposure of 180 minutes upon a plate 14 × 17 inches. The region covered extends in right ascension from 17^h40^m to 18^h10^m, and in declination from $-20^\circ.8$ to $-26^\circ.5$. About a tenth of this region is represented in the accompanying figure.*) The upper of the two nebulae is the Trifid Nebula, NGC. 6514. The lower and larger nebula is NGC. 6523. While this form of photoengraving is convenient to give a general idea of the appearance of the original negative, it is not adapted to a careful study of the plates. The images are formed of black dots upon a white background and accordingly it is impossible to derive from them the true relative positions or magnitudes of the stars represented, as is obvious if they are examined by a magnifying glass. Photogravures have accordingly been prepared of two regions, and a limited distribution, mainly to observatories, is being made of them. They are produced by contact printing from the original negatives and carry out the plan of mapping described above. That is, the photogravures are on a scale of one minute of arc to a millimetre, and cover a region five degrees square. Plate I represents the region whose centre is in RA. 16^h10^m,



Centre, RA. = 17^h56^m Decl. = $-23^\circ.7$ Trifid nebula. Taken June 11, 1896. Exposure 180^m. Scale 1′ = 0.1 cm.

*) Der vom Verfasser eingesandte photographische Abdruck eignete sich nicht zur directen Wiedergabe durch Autotypie, sondern es musste zu diesem Zweck vorher eine Zeichnung auf Papier mit Tusche entworfen werden. Die Folge davon ist, dass insbesondere die Conturen der beiden Nebel etwas schärfer hervortreten, als es auf dem Original der Fall ist. *Kr.*

Decl. —52°. The original negative was taken on June 6, 1896, with an exposure of 62 minutes. The cluster in the lower part of the plate is NGC. 6067. Plate II represents the region whose centre is in RA. $10^h 40^m$, Decl. —59°. The original negative was taken on June 1, 1896, with an exposure of 240 minutes. The images are elongated, and this plate is issued as an example of the enormous number of stars which can be shown upon a single map, while Plate I illustrates the character of the images at the centres and corners, and the quality of maps to be expected.*) It is proposed to issue, from time to time, maps of other portions of the sky, such as the Magellanic Clouds. According to the original plan a map of the entire sky on the scale here represented was to be published. To avoid duplication of work this plan has been abandoned, since the Astrophotographic Congress has undertaken to supply this want. It is believed that a less expensive and more useful scheme will be to furnish contact prints on glass from the original negatives, to such astronomers as will make use of them. A double contact print so closely resembles the original negative that it can only be distinguished from it with difficulty, and for purposes of measurement or exact study is, of course, far more valuable than any paper print.

While announcing the successful completion of the Bruce Photographic Telescope, attention should be called to the courage of the donor who permitted an experiment to be tried on a scale never before attempted, and whose liberality, both in the amount of her gift and in the terms on which it was made, rendered every aid to secure success. It is a great satisfaction to be able to show by these photographs that the results obtained are exactly as expected, and that no unforeseen difficulty interfered with the success of the experiment. Excellent results have already been obtained in photographing the spectra of very faint stars with prisms placed over the object glass of this instrument, and they will be made the subject of a subsequent communication.

Harvard College Observatory, 1896 Dec. 30. *Edward C. Pickering.*

*) Beide Tafeln sind der Redaction zugegangen. Ich bin gern bereit, dieselben den Lesern auf Wunsch zur Ansicht zu übersenden. *Kr.*

First List of Double Stars

discovered at the Royal Observatory Cape of Good Hope.

(Communicated by *David Gill,* C. B., LL. D., F. R. S., H. M. Astronomer).

Star	1900 RA.	1900 S. Decl.	P.-A.	Dist.	Mags.	Notes
Lac. 9755	$0^h 5^m 44^s$	73° 47'.0	340°	0".8	7.3 , 8.3	
Lac. 95	0 23 27	55 10.6	250	0.75	7.9 , 9.1	
Lac. 236	0 47 12	44 15.1	355	1.8	7.3 , 8.1	
Cord. ZC. 1h293	1 12 42	37 48.4	140	1.0	9.4 , 10.4	
Lac. 460	1 30 6	46 12.4	20	1.2	7.1 , 10.0	
Cord. ZC. 1h1092	1 43 31	44 28.2	180	1.0	8.5 , 9.0	
Cord. DM. —40°686	2 35 40	40 23.6	320	2.0	10.1 , 10.6	
Cord. ZC. 3h123	3 5 0	41 44.7	320	0.7	9.4 , 9.6	
P. III. 19	3 8 55	44 47.7	185	0.8	6.8 , 7.3	*a*
Cord. ZC. 3h426	3 15 6	43 0.4	260	2.5	8.6 , 10.5	
B Velorum	8 19 27	48 10.2	s. f.	1.0	5.6 , 7.6	
Cord. ZC. 8h2571	8 32 52	30 28.9	f.	4.0	8.8 , 10.3	
P. VIII. 148	8 36 39	39 54.5	n. f.	2	6.3 , 9.0	
Bris. 2199	8 42 57	42 12.0	n. p.	1.5	7.7 , 9.5	
Lac. 3539	8 43 57	38 34.4	s. f.	1.5	7.2 , 9.2	
Bris. 2285	8 53 44	49 17.7	n. p.	5	7.7 , 9.2	
Anon.	9 23 2	52 56.7	...	3	9	*b*
Lac. 4315	10 24 52	48 28.6	s. p.	3	7.2 , 10.0	
			n. f.	20	10.5	
Bris. 3101	10 31 33	63 36.7	s. p.	2	8.9 , 10.5	
Anon.	10 34 12	64 30	s. f.	3	9.0 , 9.5	
Cord. DM. —30°9211	11 23 23	30 11.3	n. f.	3	10.0 , 10.5	
o^1 Centauri	11 27 8	58 53.4	s. f.	7	5.2 , 9.0	
P. XI. 105	11 28 45	40 2.1	90°	1	6.5 , 6.5	
Cord. ZC. 11h3331	11 49 46	41 50.2	...	0.8	8.6 , 8.6	
Cord. ZC. 11h3367	11 50 20	41 20.8	n. p.	2	8.3 , 8.3	

Star	1900 RA.	1900 S. Decl.	P.-A.	Dist.	Mags.	Notes
Cord. ZC. 12h.548	12h 9m 46s	29° 12'.9	n.	1"	9.4 , 10.4	
Bris. 4084	12 25 57	40 57.1	n. p.	1	8.3 , 9.3	
Bris. 4251	12 50 59	47 8.7	p.	0.8	7.5 , 8.0	
Lac. 6183	14 48 41	36 1.3	s. p.	4	7.7 , 9.7	
Cord. ZC. 14h.3624	14 58 34	35 32.1	181°	1.5	8.9 , 10.0	
Cord. DM. −37°.10168	15 14 58	37 54.3	p.	1	9.9 , 10.9	
Cord. ZC. 15h.1167	15 15 48	38 23.2	p.	1	9.9 , 10.0	
Lac. 6437	15 31 23	52 2.6	290°	1.8	9.5 , 10.1	*c*
Lac. 6471	15 34 29	39 39.4	s. f.	1	7.0 , 9.0	
Lac. 6530	15 41 55	25 40.6	10°	1	7.4 , 10.4	
P. XVI. 37	16 13 47	39 11.2	290	6	6.4 , 10.6	
Lac. 6796	16 15 0	33 3.0	n. p.	6	7.4 , 10.0	
Lac. 6822	16 19 28	47 49.0	300°	0.8	7.8 , 10.0	
Lac. 6837	16 19 31	29 41.5	195	1	7.9 , 9.9	
Lac. 6835	16 19 37	34 45.1	100	2	8.8 , 8.9	
Lac. 6871	16 26 32	33 19.1	350	1.5	7.5 , 9.5	
Lac. 6912	16 33 51	48 34.0	180	9	5.6 , 12.0	*d*
Cord. ZC. 16h.2233	16 33 56	48 33.5	n. f.	2	8.6 , 11.3	
Lac. 6933	16 35 48	36 53.0	85°	1	7.3 , 8.3	
Cord. ZC. 16h.2834	16 42 22	43 46.0	n. f.	1	7.9 , 8.9	
Lac. 6969	16 47 39	73 15.8	s. f.	0.8	7.0 , 8.5	
Cord. ZC. 16h.3270	16 47 55	40 53.5	355°	1	9.4 , 10.4	
Lac. 7120	17 0 7	44 18.4	130	4	7.4 , 9.9	
Cord. ZC. 17h.480	17 9 3	33 43.2	320	0.7	8.4 , 9.4	*e*
Lac. 7146	17 9 7	69 55.8	s. f.	2	7.1 , 10.0	
Cord. ZC. 17h.1604	17 25 11	30 12.9	173°	2	9.1 , 9.3	
Lac. 7344	17 29 35	49 10.8	150	1	8.1 , 9.1	
Cord. GC. 10 [Mess. 6]	17 33 0	32 17.5	130	1.5	9.3 , 10.3	
Cord. DM. −40°.11849	17 40 59	40 5.8	. . .	1.5	9.8 , 10.5	
Cord. ZC. 17h.3241	17 49 24	28 3.6	s. p.	2.7	9.7 , 10.5	
Lac. 7503	17 51 52	47 45.8	125°	1.5	7.7 , 9.7	
Lac. 7593	18 7 37	56 40.7	310	1	7.3 , 9.8	
Lac. 7889	18 46 33	47 23.7	s.	2	6.8 , 10.0	
Bris. 6535	18 51 18	48 38.4	225°	3	6.9 , 11.0	
Cord. GC. 26377	19 10 32	63 4.5	280	0.7	8.2 , 9.0	
1st Melb. 983	19 16 37	62 22.5	315	3	8.0 , 11.0	
Lac. 8102	19 23 26	60 28.6	180	1	7.3 , 8.3	
Lac. 8124	19 25 32	36 59.0	137	1	7.1 , 9.6	
Lac. 8163	19 34 0	59 14.2	175	1.2	7.7 , 9.0	
Lac. 8194	19 40 14	62 3.5	185	0.8	7.6 , 8.1	*f*
Lac. 8207	19 42 16	59 26.6	80	0.7	5.7 , 7.7	
Lac. 8352	20 3 30	47 1.6	177	6	7.2 , 11.0	
Bris. 6817	20 9 30	63 28.0	45	2	7.8 , 10.5	
Cord. ZC. 20h.252	20 9 32	46 12.8	40	1	8.6 , 9.4	
Cord. ZC. 20h.438	20 15 19	57 25.6	p.	1	9.5 , 10.0	
Anon.	20 27	44 50	100	0.6	9.5 , 10.0	*g*
Bris. 6902	20 36 18	52 9.4	325	2.3	7.9 , 10.4	
Rü. 529	20 48 34	59 39.2	30	1	8.1 , 10.1	
Lac. 8650	20 57 15	48 21.3	313	3.2	7.1 , 11.0	
Anon.	21 14 57	52 12.3	n.	1	9.5 , 10.0	
Lac. 8779	21 16 5	52 22.0	300°	1.3	7.6 , 10.0	
Cord. ZC. 21h.664	21 23 4	39 15.9	. . .	4	8.5 , 11.0	
Lac. 9188	22 32 0	40 22.6	290	2.5	6.7 , 11.0	
AOe$_2$ 22432	22 43 51	20 47.3	n. p.	2	9.6 , 10.1	
Lac. 9405	23 9 36	60 14.3	5°	2.5	7.3 , 10.5	
Lac. 9641	23 49 54	37 55.2	215	0.8	7.8 , 8.3	

Notes.

a. The chief star of h 3556.

b. Position given is that of I Velorum, the comes 50″ distant is double.

c. The comes of the old pair Dunlop 189.

d. A quadruple star:
B = 9.5 mag. 12° 2″ Melbourne 1878
C = New Companion
D = h 4876.

e. One night's observation only.

f. The chief star of h 5141.

g. ν Microscopii is 65″ s. p.

The above new double stars were discovered by Mr. *R. T. A. Innes*, with the 6.9 in. Equatoreal of the Cape Observatory between the months of April and October 1896. The position angles and distances are estimations as the driving of the telescope by the clock is not steady enough to allow of micrometrical measures.

Royal Observatory, Cape of Good Hope, 1896 Oct. 27.

Zusatz. Im Anschluss an das vorstehende Verzeichniss macht Herr *R. T. A. Innes* d. d. 12. Jan. 1897 noch die folgenden Bemerkungen.

P. III. 19. The duplicity of the chief star of this triple was suspected by Jacob in 1856.

Bris. 2199. This was discovered by Jacob in 1856.

Lac. 6835. This is not new being Hough 404.

Ausserdem theilt Herr *Innes* die folgenden Berichtigungen mit.

Innes 1 in M. N. of R. A. S. Vol. LV. This is not Bris. 118 but UA 64 Toucani, and was noted as a double star at Cordoba in 1873.

Innes 42 = Yarn. 9104. In Journal B. Ast. Association Vol. VI April 1896. With the 7 in. equ. of the Cape Observatory this star is not double. — It will be omitted from further lists.

Innes 18. This was wrongly identified as Lac. 8600. It is Lac. 8602, mag. 7.4, RA. $20^h 47^m 53^s$, S. Decl. 52°29′.7 (1900); 1896.7: 5°± 4″±, 7.5 and 11.7.

Kr.

Die gegenwärtige Helligkeit der Nova (T) Aurigae.

Da ich am 26. November Gelegenheit hatte, die Nova Aurigae wieder einmal zu photographiren, so benutzte ich dieselbe, um die Nova bezüglich ihrer Helligkeit an Plejadensterne photographisch anzuschliessen.

Ich habe, da die Durchmesser bei der Kürze der Aufnahmezeiten von jeweils 30 Minuten zu klein waren für mikrometrische Messung, den Anschluss durch Stufenschätzen ausgeführt. Aus einer grösseren Anzahl Vergleichungen habe ich die brauchbaren in der folgenden Tabelle zusammengestellt, wobei die Nummern der Sterne diejenigen des Wolf'schen Catalogs, also dieselben wie bei Charlier sind. Es erscheint

Stern	70	um	2	Stufen	heller	als	Nova
»	61	»	1	»	»	»	»
»	90	»	2	»	schwächer	»	»
»	85	»	2	»	heller	»	»
»	88	»	1	»	schwächer	»	»
»	92	»	0	»	»	»	»
»	80	»	2	»	heller	»	»
»	74	»	1	»	schwächer	»	»
»	93	»	2	»	heller	»	»
»	89	»	0	»	schwächer	»	»

Heidelberg, 1896 Dec. 2.

Die Stufe kann ich in diesem Falle als rund ¼ einer Grössenclasse annehmen, so dass sich für die Nova die folgenden Helligkeiten ergeben:

Stern	Gr. nach Charlier	Helligkeit der Nova
70	$12^m.5$	$13^m.0$
61	12.5	12.7
90	13.5	13.0
85	12.5	13.0
88	13.5	13.0
92	13.0	13.0
80	12.0	12.5
74	13.0	12.7
93	12.5	13.0
89	13.0	13.0

Hieraus folgt für die Nova die Helligkeit $12^m.9$. Man kann also annehmen, dass die Nova Aurigae gegenwärtig (Nov. 26, 1896) fast genau von der dreizehnten Grösse bezüglich ihrer photographischen Helligkeit ist. Es ist noch zu bemerken, dass der Stern 61 gegenwärtig etwas schwächer als der Stern 70 ist, während Charlier und Wolf beide Sterne einander gleich gefunden haben.

Max Wolf.

Bemerkung zu der Abhandlung „Ueber die systematischen Fehler der Distanzmessungen mit neueren Heliometern", Astr. Nachr. 3397-98.

In genannter Abhandlung sucht Herr Dr. Cohn den etwaigen constanten Fehler der Heliometermessungen dadurch zu ermitteln, dass er die Hauptdistanz zwischen den Endsternen eines Sternbogens mit der Summe der Partialdistanzen, nachdem letztere auf die Hauptdistanz projicirt sind, vergleicht. Er behandelt dabei diese Projectionen der Partialdistanzen wie direct gegebene Grössen; in Folge dessen glaubt er von den Unsicherheiten der Meridianbestimmungen frei zu werden und die Correctionen der letzteren ableiten zu können. Dies Verfahren ist jedoch nur dann erlaubt, wenn die sämmtlichen Sterne eines Bogens sehr nahe in einem Bogen grössten Kreises liegen; wenigstens, sobald die Projectionsfactoren aus den Meridianpositionen abgeleitet sind, wie es in den betrachteten Fällen (ausser bei dem Elkin'schen Controlbogen) zutrifft.

Ich habe vor etwa 10 Jahren darauf aufmerksam gemacht, dass die üblichen Projectionsfactoren in beträchtlichem Grade von der Unsicherheit der Meridianpositionen abhängig sind, und zwar von der Unsicherheit in einer zur Hauptdistanz senkrechten Richtung. Es sind daher auf meinen Vorschlag die Bd. V S. 362 u. 371 der »Venusdurchgänge von 1874 und 1882« angegebenen Differentialquotienten der Logarithmen der Projectionsfactoren für Hydra- und Cygnusbogen von mir berechnet worden, dieselben sind erheblich von der Unsicherheit der Rectascensionen abhängig. Ich halte jedoch überhaupt die Einführung der Projectionsfactoren für verwerflich; dieselben scheinen hauptsächlich dazu zu dienen, um den Einfluss der Unsicherheit der Meridianpositionen zu verhüllen; Vortheil böten die Projectionsfactoren nur dann, wenn sie aus Positionswinkelmessungen an Heliometern mit genügender Schärfe abgeleitet wären. Man kommt zu dem gleichen Ziel, nämlich der grösstmöglichen Elimination der Oerter der inneren Sterne, wenn man die Summe der heliometrisch bestimmten Distanzen mit der Summe der aus den Meridianbeobachtungen abgeleiteten vergleicht; hierdurch erhält man den nothwendig verbleibenden Einfluss der inneren Sterne in der bequemsten und übersichtlichsten Form. Es hätte dieser Einfluss jedenfalls angegeben werden müssen. Ich verweise auf Astr. Nachr. Bd. 122 S. 376 ff.

Die Göttinger Controlbogen liegen sehr nahe in einem Bogen grössten Kreises, und es dürfte für diese der betrachtete Einfluss gering sein.

Berlin 1897 Jan. 20.

H. Battermann.

Flecke auf Jupiter.

Am 29. November vorigen Jahres fand ich am 7 Zöller bei Luft II und Vergr. 233 einen »tiefdunklen Fleck im Nord-Aequ.-Band, länglich in der Richtung nach NO.« Derselbe war auch an einem Fraunhofer von 77 mm und Vergrösserung 131 nach der Bemerkung im Tagebuch noch »gut zu sehen«. Letzteres Citat möge als Hinweis auf die leichte Sichtbarkeit gelten. Der Fleck, zum kleinen Theil auf dem schmalen und matten Bande liegend, mit dem dünneren Ende in der nördlicheren hellen Zone, schien fast ein Doppelfleck zu sein, aus zwei ungleichen rundlichen Scheibchen bestehend. Nach ziemlich genauen Abmessungen war am 29. November seine Länge $\lambda = 74^\circ\!.5$. Am 3. November hatte ich Jupiter bei Luft II–III, Vergr. 176, gezeichnet, am 10. November ebenfalls bei Luft I–II, Vergrösserung 233 und λ war für Jupiter $30^\circ\!.9$ resp. $54^\circ\!.3$. Beide Mal war keine Spur eines dunklen Flecks zu bemerken, obwohl die betreffende Gegend sehr gut sichtbar gewesen wäre. Inzwischen hat das Wetter keine Beobachtung mehr erlaubt, doch meldete Herr W. Juul aus Kopenhagen eine Wahrnehmung vom 20. Januar 1897, am 6 Zöller geschehen, nach welcher in der Breite meines Flecks zwei nahe dunkle Flecke vorhanden wären. Leider liegt lediglich diese Mittheilung vor; jedoch sind fast genau 125 Rotationen seit meiner Zeichnung verstrichen, weshalb eine Identität zweifellos sein dürfte, mein damals schon eingeschnürter Fleck sich wirklich getheilt hätte und jeder Theil seine eigene Geschwindigkeit besässe.

Vielleicht wiederholt sich, was in der vorigen Opposition bei dem Fleck in der nämlichen Breite beobachtet wurde, weshalb es gestattet sein möge, auf die Verfolgung und die Beobachtung der Meridiandurchgänge des Objects hinzuweisen.

Landstuhl, Privatsternwarte, 1897 Januar.

Ph. Fauth.

Notiz.

Auf der beigegebenen Reproduction der Lowell'schen Venuskarte (Tafel III) sind leider einige Buchstaben nicht genügend deutlich zum Ausdruck gekommen. Ich bitte daher dieselben an den folgenden Stellen einzeichnen zu wollen.

	λ	β		λ	β		λ	β		λ	β
a	349°	+29°	*g*	61°	+22°	*k*	73°	−8°	*s*	5°	−23°
b	332	−15	*h*	12	+17	*n*	21	−20	*u*	38	−7
f	47	−20	*j*	73	+7	*o*	57	−44	*v*	5	+43

Kr.

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