RESULTS

OF THE

PHOTO-HELIOGRAPHIC OBSERVATIONS

MADE AT THE

ROYAL OBSERVATORY, GREENWICH,

IN THE YEAR

1901:

UNDER THE DIRECTION OF

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ASTRONOMER ROYAL.

(EXTRACTED FROM THE GREENWICH OBSERVATIONS, 1901.)

GREENWICH PHOTO-HELIOGRAPHIC
RESULTS, 1901.

INTRODUCTION.

§ 1. *Measures of Positions and Areas of Sun Spots and Faculæ on Photographs taken at the Royal Observatory, Greenwich, at Dehra Dûn in India, and at the Royal Alfred Observatory, Mauritius, in the year* 1901 ; *with the deduced Heliographic Longitudes and Latitudes.*

The photographs from which these measures were made were taken either at Greenwich; at Dehra Dûn, North-West Provinces, India; or at the Royal Alfred Observatory, Mauritius.

The photographs of the Greenwich series were taken either with the Thompson or with the Dallmeyer Photoheliograph. The Thompson Photoheliograph, which was in regular use at the beginning of the year, is a photographic refractor of 9 inches aperture, presented to the Royal Observatory by Sir Henry Thompson, which has been fitted with an enlarging doublet by Ross, and with a camera and shutter for rapid exposure so as to take photographs of the Sun on a scale of about 7·5 inches to the solar diameter. The Dallmeyer, which was substituted for the Thompson while the former was in use for the Eclipse expedition to Sumatra, from 1901 February 15 to 1901 September 19, is an instrument used in the Transit of Venus expedition to New Zealand, which, as now adapted, gives a solar image of 8 inches diameter on the photographic plate.

The photographs, have been taken throughout the year on gelatine dry plates, "Lantern" plates supplied by R. W. Thomas and Co. being used, with hydroquinone development.

The Indian photographs, which have been forwarded by the Solar Physics Committee to fill the gaps in the Greenwich series, were taken under the

superintendence of the Deputy Surveyor-General, Trigonometrical Survey of India, with a Dallmeyer Photoheliograph giving an image of the Sun nearly 8 inches in diameter. In the process adopted at Dehra Dûn, bromo-iodized collodion wet-plates have been generally used in connexion with iron development; but several "Lantern" dry-plates have also been taken.

The Mauritius photographs were taken under the superintendence of Mr. T. F. Claxton, Director of the Royal Alfred Observatory, Mauritius, with a Dallmeyer Photoheliograph, giving an image of the Sun about 8 inches in diameter. At the Mauritius Observatory bromo-iodized gelatine dry plates have been used with alkaline development.

Photographs of the Sun were taken at Greenwich on 149 days, and Indian photographs on 189 days with Mauritius photographs on 21 days have been received from the Solar Physics Committee to complete the total of 359 days for which there are either Greenwich, Indian, or Mauritius photographs of the Sun available for measurement in 1901.

The *first* column on each page contains the Greenwich civil time at which each photograph was taken, expressed by the day of the year and decimals of a day, reckoning from Greenwich mean midnight January 1d. 0h., and also by the day of the month (civil reckoning), which latter is placed opposite the total area of Spots and Faculæ for the day. The photographs taken in India are distinguished by the letter I., and those taken in Mauritius by the letter M.

The *second* column contains the initials of the two persons measuring the photograph; the initial on the left being that of the person who measured the photograph on the left of the centre of the measuring instrument, and that on the right being that of the person who measured on the right of the centre.

The following are the signatures of those persons who measured the photographs for the year 1901 :—

P. H. Cowell	-	- C	T. G. Staples	-	- TS
E. W. Maunder	-	- M	R. Fowler	-	- RF

The *third* column gives the No. of the group, and the letter for the spot. The groups are numbered in order of their appearance.

The *next two* columns give the distance from the centre of the Sun in terms of the Sun's radius, and the position-angle from the Sun's axis, reckoned from the

Sun's north pole in the direction n, f, s, p, both results being corrected for the effects of astronomical refraction.

The measures of the photographs were made with a large position-micrometer specially constructed by Messrs. Troughton and Simms for the measurement of photographs of the Sun up to 12 inches in diameter. In this micrometer the photograph is held with its film-side uppermost on three pillars fixed on a circular plate, which can be turned through a small angle, about a pivot in its circumference, by means of a screw and antagonistic spring acting at the opposite extremity of the diameter. The pivot of this plate is mounted on the circumference of another circular plate, which can be turned by screw-action about a pivot in its circumference, 90° distant from that of the upper plate, this pivot being mounted on a circular plate with position-circle which rotates about its centre. By this means small movements in two directions at right angles to each other can be readily given, and the photograph can be accurately centred with respect to the position-circle. When this has been done, a positive eyepiece, having at its focus a glass diaphragm ruled with cross-lines into squares, with sides of one-hundredth of an inch (for measurement of areas), is moved along a slide diametrically across the photograph, the diaphragm being nearly in contact with the photographic film, so that parallax is avoided. The distance of a spot or facula from the centre of the Sun is read off by means of a scale and vernier to 1-250th of an inch (corresponding to 0·001 of the Sun's radius for photographs having a solar diameter of 8 inches). The position-angle is read off on a large position-circle which rotates with the photographic plate. The photograph is illuminated by diffused light reflected from white paper placed at an angle of 45° between the photograph and the plate below.

The following is the process of measurement of a photograph :—By means of the screws attached to the circular plates carrying the pillars which hold the photograph, the image of the Sun is centred as accurately as possible by rotation. The position-circle is then set to the readings 0°, 90°, 180°, and 270° in succession, and the scale readings taken for the two limbs. The scale being so adjusted that its zero coincides with the centre of rotation of the position-circle, the mean of the eight readings for the limb gives the mean radius of the Sun directly.

At the principal focus of the photoheliograph are two cross-spider-lines which serve to determine the zero of position-angles on the photograph.

The zero of position-angles for the Thompson and Dallmeyer Photoheliographs, employed at Greenwich has been determined by the measurement of a plate which

has been exposed to the Sun's rays twice, with an interval of about 100 seconds between the two exposures, the instrument being firmly clamped. Two images of the Sun, overlapping each other by about a fifth part of the Sun's diameter, were therefore produced upon the plate, and the exposures having been so given that the line joining the cusps passed approximately through the centre of the plate, the inclination of the wires of the photoheliograph to this line was measured with the position-micrometer, and a small correction for the inclination of the Sun's path was then applied. The following tables give the correction for zero of position for the mean of the two wires as thus determined :—

Thompson Photoheliograph, to 1901 February 15.

Date, Greenwich Civil Time.		Correction for Zero.
	d h	o ′
1900 December	14. 10	— 0. 28
	29. 11	— 0. 19
1901 January	15. 11	— 0. 13
February	15. 11	— 0. 8

A correction of —0°·3 for zero of position has been applied to all photographs taken with the Thompson Photoheliograph up to 1901 February 15.

Dallmeyer Photoheliograph, 1901 February 15 to September 19.

Date, Greenwich Civil Time.		Correction for Zero.
	d n	o ′
1901 March	1. 11	+ 0. 24
1901 May	3. 11	+ 0. 22
June	8. 10	+ 0. 26
August	13. 12	+ 0. 40
September	3. 12	+ 0. 36
	18. 11	+ 0. 30

The wires were taken out, adjusted to centre, and replaced, on 1901 May 3, before any photographs were taken.

A correction of $+0°\cdot4$ for zero of position has been applied to all photographs taken with the Dallmeyer Photoheliograph from 1901 February 15 to 1901 May 2, and a correction of $+0°\cdot5$ to all photographs taken with that instrument from 1901 May 3 to 1901 September 19.

Thompson Photoheliograph, from 1901 September 19.

Date, Greenwich Civil Time.		Correction for Zero.	
	d. h	°	′
1901 September	26. 12	+ 0.	35
October	10. 11	+ 0.	23
	28. 11	+ 0.	11
November	2. 11	+ 0.	23
	28. 12	+ 0.	36
1902 January	25. 12	+ 0.	25
February	5. 13	+ 0.	23

A correction of $+0°\cdot4$ for zero of position has been applied to all photographs taken with the Thompson Photoheliograph since 1901 September 19.

The Thompson Photoheliograph was mounted on the tube of the 26-inch Thompson Photographic refractor throughout the year, excepting during the period 1901 February 15, to September 19, when it was dismounted for use in the observation of the total solar eclipse of 1901 May 18, at Aoer Gadang, near Sumatra. The Thompson Photoheliograph is not fitted with a position-circle, and the position-angle of the wires, which are approximately parallel and perpendicular to the circle of declination cannot be altered.

The Dallmeyer Photoheliograph was mounted on the tube of the 26-inch Thompson Photographic refractor, during the period 1901 February 15 to September 19, when the Thompson Photoheliograph was removed. The Dallmeyer Photoheliograph was dismounted on 1901 September 19, and placed in the upper floor of the Museum.

In the use at Greenwich of the Dallmeyer Photoheliograph the position circle has usually been set to some convenient reading near that for zero, so that the wires are respectively very nearly parallel and perpendicular to the circle of declination, and a correction for zero of position of the photoheliograph for the mean of the two wires has been applied to the zero of the position-circle of the micrometer. The position-circle was set to the reading $354°\cdot0$ throughout 1901.

The zero of the position-circle of the micrometer has been determined from the readings of the position-circle for the four extremities of the two wires. The resulting combined correction is applied to all position-circle readings for spots and faculæ, so as to give true position-angles.

In the use of the photoheliographs at Dehra Dûn and in Mauritius the position circle has always been set to the zero as determined by allowing the diurnal motion to carry a spot or the Sun's limb along the horizontal wire, and the accuracy of the adjustment has been tested at short intervals. No correction for zero of position of the wires has therefore been applied for the reduction of the photographs taken in India or in Mauritius.

The uncorrected distance from the Sun's centre for spots and faculæ is read off directly to 1-250th of an inch by means of a scale and vernier, the zero of the scale of the new micrometer being adjusted to coincide with the centre of the instrument.

Two sets of measures of the Sun's limb and of spots and faculæ on each photograph have been taken, and the mean of the two sets adopted.

No correction has been applied to the photographs on account of distortion.

The correction for the effect of refraction has been thus found, the Sun's image being assumed to be sensibly an ellipse. The refraction being sensibly $c \tan z$ where $c = \sin 57''\cdot5 = \frac{1}{3600}$ nearly, and z is the apparent zenith-distance, we shall have—

$$\frac{\text{Vertical Diameter}}{\text{Horizontal Diameter}} = \frac{1 - c \sec^2 z}{1 - c} = 1 - c \tan^2 z\ ;$$

and thus the effect of refraction will be to diminish any vertical ordinate y by the quantity $c \tan^2 z$. Resolving this along and perpendicular to the radius vector r, and putting v for the position-angle of the vertex, we have for δr and $\delta \theta$, the corrections to radius vector and position-angle for the effect of refraction—

$$\delta r = + c \cdot \tan^2 z \times r \cdot \cos^2 (\theta - v) = + c \cdot \tan^2 z \times r \times \frac{1 + \cos 2\ (\theta - v)}{2},$$

$$\delta \theta = - c \cdot \tan^2 z \cdot \sin (\theta - v) \cdot \cos (\theta - v) = - c \cdot \tan^2 z\ \frac{\sin 2\ (\theta - v)}{2}.$$

The quantity δr thus found is the correction, on the supposition that a horizontal diameter of the Sun is taken as the scale. But, as the mean of two diameters at right angles has been used, the scale itself requires the correction

$$\delta R = + c \cdot \tan^2 z \times R \times \tfrac{1}{2} \left\{ \frac{1 + \cos 2\ (\theta_0 - v)}{2} + \frac{1 + \cos 2\ (\theta_0 + 90^\circ - v)}{2} \right\} = + \tfrac{1}{2} c\ R \cdot \tan^2 z,$$

where R is the Sun's mean radius and θ_0, $\theta_0 + 90^\circ$ the position-angles of the two diameters measured. Thus the final correction to r becomes—

$$\delta r = + c \cdot \tan^2 z \times r \times \frac{\cos 2\ (\theta - v)}{2}.$$

The quantities $c \tan^2 z$, $- \frac{\sin 2\ (\theta - v)}{2}$, and $\frac{\cos 2\ (\theta - v)}{2}$ have been tabulated for use

as follows, $c \tan^2 z$ being expressed in circular measure and in arc for application to distances and position-angles respectively :—

$$c \tan^2 z.$$

z.	In Circular Measure.	In Arc.	z.	In Circular Measure.	In Arc.	z.	In Circular Measure.	In Arc.
°		′	°		′	°		′
80	·0089	31	70	·0021	7	60	·0008	3
79	·0073	25	69	·0019	6½	58	·0007	2
78	·0061	21	68	·0017	6	56	·0006	2
77	·0052	18	67	·0015	5½	54	·0005	2
76	·0045	15	66	·0014	5	52	·0005	2
75	·0039	13	65	·0013	4½	50	·0004	1
74	·0034	11½	64	·0012	4	45	·0003	1
73	·0030	10	63	·0011	4	40	·0002	1
72	·0026	9	62	·0010	3	30	·0001	0
71	·0023	8	61	·0009	3			

Factors for Refraction.

$\theta-v$	$\theta-v$	$-\dfrac{\sin 2(\theta-v)}{2}$	$\dfrac{\cos 2(\theta-v)}{2}$	$\theta-v$	$\theta-v$	$-\dfrac{\sin 2(\theta-v)}{2}$	$\dfrac{\cos 2(\theta-v)}{2}$
°	°			°	°		
0	180	·00	+ ·50	90	180	·00	− ·50
5	185	− ·09	+ ·49	95	275	+ ·09	− ·49
10	190	− ·17	+ ·47	100	280	+ ·17	− ·47
15	195	− ·25	+ ·43	105	285	+ ·25	− ·43
20	200	− ·32	+ ·38	110	290	+ ·32	− ·38
25	205	− ·38	+ ·32	115	295	+ ·38	− ·32
30	210	− ·43	+ ·25	120	300	+ ·43	− ·25
35	215	− ·47	+ ·17	125	305	+ ·47	− ·17
40	220	− ·49	+ ·09	130	310	+ ·49	− ·09
45	225	− ·50	·00	135	315	+ ·50	·00
50	230	− ·49	− ·09	140	320	+ ·49	+ ·09
55	235	− ·47	− ·17	145	325	+ ·47	+ ·17
60	240	− ·43	− ·25	150	330	+ ·43	+ ·25
65	245	− ·38	− ·32	155	335	+ ·38	+ ·32
70	250	− ·32	− ·38	160	340	+ ·32	+ ·38
75	255	− ·25	− ·43	165	345	+ ·25	+ ·43
80	260	− ·17	− ·47	170	350	+ ·17	+ ·47
85	265	− ·09	− ·49	175	355	+ ·09	+ ·49
90	270	·00	− ·50	180	360	·00	+ ·50

The position-angle of the vertex v is readily taken from a globe.

(b)

The distance from centre in terms of the Sun's radius given in the *fourth* column is then readily found by dividing the measured distance r_0, as corrected for refraction, by the measured mean radius of the Sun, R; and the position-angle from the Sun's axis given in the *fifth* column is obtained by applying to the position-angle (from the N. point) corrected for refraction the position-angle of the Sun's axis derived from the *Auxiliary Tables for determining the Angle of Position of the Sun's Axis, and the Latitude and Longitude of the Earth referred to the Sun's Equator*, by Warren De La Rue, F.R.S.

The *sixth* and *seventh* columns give the heliographic longitude and latitude of the spot, which are thus computed.* Let r be the measured distance of a spot from the centre of the Sun's apparent disk, R the measured radius of the Sun on the photograph, (R) the tabular semidiameter of the Sun in arc, and ρ, ρ' the angular distances of a spot from the centre of the apparent disk as viewed from the Sun's centre and from the Earth respectively. Then we have—

$$\rho' = \frac{r}{R}(R); \text{ and } \sin(\rho + \rho') = \frac{r}{R},$$

$$\text{whence } \rho = \sin^{-1}\frac{r}{R} - \rho'.$$

Log. sin ρ and log. cos ρ, as computed from this formula, are given in *Tables for the Reduction of Solar Observations No. 2*, by Warren De La Rue, F.R.S. Then, if D, λ are the heliographic latitudes of the Earth and the spot respectively, referred to the Sun's equator, and L, l the heliographic longitudes reckoned from the ascending node of the Sun's equator on the ecliptic, and χ the position-angle from the Sun's axis, we have by the ordinary equations of spherical trigonometry—

$$\sin \lambda = \cos \rho \sin D + \sin \rho \cos D \cos \chi$$
$$\sin (L - l) = \sin \chi \sin \rho \sec \lambda.$$

The quantities L and D are derived from Warren De La Rue's *Auxiliary Tables* before referred to, in the computation of which the following formulæ have been used—

$$\tan L = \cos I \tan (\odot - N)$$
$$\sin D = \sin I \sin (\odot - N)$$

where I is the inclination of the Sun's equator to the ecliptic, N the longitude of the ascending node, and $\odot$ the longitude of the Sun.

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* "Researches on Solar Physics: Heliographical Positions and Areas of Sun Spots observed with the Kew Photoheliograph during the years 1862 and 1863," by W. De La Rue, B. Stewart, and B. Loewy. *Phil. Trans.*, 1869.

The position-angle χ is given by the formula—

$$\chi = P + G + H$$

where P is the position-angle from the north point of the Sun, and G and H two auxiliary angles given by the formulæ—

$$\tan G = \tan \omega \cos \odot$$
$$\tan H = \tan I \cos (\odot - N)$$

where ω is the obliquity of the ecliptic.

It will be seen that G is the inclination of two planes through the line joining the centres of the Earth and Sun passing through the poles of the Earth and of the ecliptic respectively, and that H is the inclination of two planes through the same line, and the poles of the Sun and of the ecliptic. The values assumed for I, N, ω in the computation of the tables are $7°.15'$, $74°.23'$, and $23°.27'\cdot5$ respectively.

The heliographic longitude of the spot is found from l, the heliographic longitude from node, by subtracting the reduction to the prime meridian, which is the longitude of the node at the epoch of the photograph, referred to the assumed prime meridian, the latter being the meridian which passed through the ascending node at mean noon, 1854 Jan. 1. The period of rotation assumed is $25\cdot38$ days.

The heliographic longitude and latitude of the centre of the Sun's disk at the time of the exposure of each photograph are also given (in brackets) in the *sixth* and *seventh* columns respectively. The longitude of the centre of the disk is found by subtracting the reduction to the prime meridian from L, the longitude of the centre from the node. The latitude of the centre is of course the same as D, the heliographic latitude of the Earth.

The measures of areas given in the *last three* columns were made with a glass diaphragm ruled into squares, with sides of one-hundredth of an inch, and placed as nearly as possible in contact with the photographic film. The integral number of squares and parts of a square contained in the area of a spot or facula was estimated by the observer, two independent sets of measures being made by two observers. The mean of the two sets of measures has been taken for each photograph. The factor for converting the areas, as measured in ten-thousandths of a square inch, into millionths of the Sun's visible hemisphere, allowing for the effect of foreshortening, has been inferred by means of a table of double entry, giving the equivalent of one square for different values of the Sun's radius, and for different distances of the spot or facula from the Sun's centre as measured by means of the position-micrometer.

The individual spots in a group have in some cases not been measured separately but combined into a cluster of two or three small spots close together, the position of the centre of gravity and the aggregate area of the cluster being given. The actual number of individual spots is usually stated in the notes.

§ 2. *Ledgers of Areas and Heliographic Positions of Groups of Sun Spots deduced from the measurement of the Solar photographs for each day in the year* 1901.

In these ledgers the daily results for each group are collected together from the measures of the individual spots and given in a condensed form. The first column gives, for each day on which the group was observed, the Greenwich civil time at which each photograph was taken, expressed by the day of the month (civil reckoning) and the decimals of a day reckoning from Greenwich mean midnight. The second and third columns give the sums, for each day, of the projected areas of all the umbræ and whole spots comprised in the group, the projected area being the area as it is measured upon the photograph, uncorrected for foreshortening, and expressed in millionths of the Sun's apparent disk. The fourth and fifth columns give the sums for each day of the areas of all the umbræ and whole spots comprised in the group, corrected for foreshortening, and expressed in millionths of the Sun's visible hemisphere. The sixth and seventh columns give the mean longitude and latitude of the group, found by multiplying the longitude and latitude of each separately measured component of the group by its area, and dividing the sum of the products by the sum of the areas. The last column gives the mean longitude of the group from the central meridian, and is found by subtracting the longitude of the centre of the disk from the mean longitude of the group. At the foot of these daily results for each group are given the mean areas of umbræ and whole spots and the mean longitude and latitude for the period of observation.

§ 3. *Total Projected Areas of Sun Spots and Faculæ for each day, and Mean Areas and Mean Heliographic Latitude of Sun Spots and Faculæ for each Rotation of the Sun, and for the year* 1901.

This section requires no further explanation.

W. H. M. CHRISTIE.

Royal Observatory, Greenwich.
   1902, *February* 28.

ROYAL OBSERVATORY, GREENWICH.

MEASURES OF POSITIONS AND AREAS

OF

SUN SPOTS AND FACULÆ

ON

PHOTOGRAPHS

TAKEN WITH THE

PHOTOHELIOGRAPHS

AT GREENWICH, IN INDIA, AND IN MAURITIUS,

WITH THE DEDUCED

HELIOGRAPHIC LONGITUDES AND LATITUDES.

1901.

MEASURES of POSITIONS and AREAS of SUN SPOTS and FACULÆ on PHOTOGRAPHS taken at the ROYAL OBSERVATORY, GREENWICH, at DEHRA DÛN in INDIA, and at the ROYAL ALFRED OBSERVATORY, MAURITIUS, in the Year 1901.

NOTE.—The Greenwich Civil Time at which the Photograph was taken is expressed by the Day of the Year and decimals of a day, reckoning from Midnight, January 1d 0h.
For convenience of reference, the Month and Day of the Month (Civil Reckoning) are added.
The letter I. signifies that the photograph was taken in India; the letter M. that the photograph was taken in Mauritius; the time given is Greenwich Civil Time.
The position-angles are reckoned from the North Pole of the Sun's Axis in the direction N., E., S., W., N.

Greenwich Civil Time.	Measurers.	No. of Group, and Letter for Spot.	Distance from Centre in terms of Sun's Radius.	Position Angle from Sun's Axis.	HELIOGRAPHIC Longitude.	HELIOGRAPHIC Latitude.	SPOTS. Area of UMBRA for each Spot (and for Day).	SPOTS. Area of WHOLE for each Spot (and for Day).	FACULÆ. Area for each Group (and for Day).	Greenwich Civil Time.	Measurers.	No. of Group, and Letter for Spot.	Distance from Centre in terms of Sun's Radius.	Position Angle from Sun's Axis.	HELIOGRAPHIC Longitude.	HELIOGRAPHIC Latitude.	SPOTS. Area of UMBRA for each Spot (and for Day).	SPOTS. Area of WHOLE for each Spot (and for Day).	FACULÆ. Area for each Group (and for Day).
1901. Jan. 1 to Jan. 12		No	Spots	or	Faculæ					1901. 36·199 I. Feb. 6	TS, M	4949 Centre	0·709	95·4	101·2 (146·5)	− 8·4 (− 6·4)	8 (8)	25 (25)	(0)
Jan. 13		No	photo	graph						37·162 I. Feb. 7	TS, M	4949 Centre	0·534	95·4	101·4 (133·8)	− 8·4 (− 6·5)	9 (9)	22 (22)	(0)
13·457 Jan. 14	RF, TS	4948 Centre	0·348	252·9	105·6 (85·9)	− 10·2 (− 4·6)	0 (0)	7 (7)	(0)										
Jan. 15 to Jan. 23		No	Spots	or	Faculæ					38·181 I. Feb. 8	TS, M	4949 Centre	0·318	96·2	101·8 (120·3)	− 8·2 (− 6·6)	5 (5)	18 (18)	(0)
Jan. 24		No	photo	graph						39·307 I. Feb. 9	RF, M	4949 Centre	0·060	115·0	102·4 (105·5)	− 8·1 (− 6·6)	2 (2)	10 (10)	(0)
Jan. 25 to Feb. 3		No	Spots	or	Faculæ					Feb. 10 and Feb. 11		No	Spots	or	Faculæ				
34·275 I. Feb. 4	TS, M	4949 Centre	0·945	96·7	100·5 (171·8)	− 8·4 (− 6·3)	19 (19)	58 (58)	220f (220)	42·471 Feb. 12	RF, TS	4949 Centre	0·609	263·4	101·6 (63 9)	− 9·4 (− 6·8)	0 (0)	5 (5)	(0)
										Feb. 13 to Feb. 26		No	Spots	or	Faculæ				
35·274 I. Feb. 5	TS, M	4949 Centre	0·845	96·0	100·6 (158·6)	− 8·5 (− 6·4)	9 (9)	40 (40)	223f (223)	Feb. 27		No	photo	graph.					

The Groups of Spots are numbered in the order of their appearance. When there is no number in the third column, it is to be understood that there is a Facula unaccompanied by a Spot. The positions of Faculæ relative to the Spots with which they are associated are indicated by the letters n, s, p, f, c, denoting respectively north, south, preceding, following, concentric. The longitude and latitude of the centre of the disk are given in brackets.
The Areas of Spots and Faculæ are expressed in millionths of the Sun's visible Hemisphere.

Group 4948, January 14. A very small faint spot.
Group 4949, February 4–12. A single spot which diminishes in size from day to day. It is not seen on February 10 or 11, but a very small faint spot is seen near its place on February 12.

Measures of Positions and Areas of Sun Spots and Faculæ on Photographs—*continued.*

Left half:

Greenwich Civil Time	Measurers	No. of Group, and Letter for Spot	Distance from Centre in terms of Sun's Radius	Position Angle from Sun's Axis	Longitude	Latitude	Area of UMBRA each Spot (and for Day)	Area of WHOLE each Spot (and for Day)	Area for each Group (and for Day)
1901. 58·281 I. Feb. 28	RF, M	Centre	0·949	96·1	143·6 (215·7)	− 8·0 (−7·2)	(0)	(0)	236 (236)
Mar. 1 and Mar. 2		No	Spots	or	Faculæ				
61·544 Mar. 3	TS, M	4950 Centre	0·904	92·4	107·7 (172·5)	− 5·2 (−7·2)	1 (1)	16 (16)	336c (336)
62·196 I. Mar. 4	TS, M	4951a 4951b 4950 Centre	0·296 0·328 0·832	59·5 65·6 91·2	149·4 146·8 107·7 (164·1)	+ 1·6 + 0·9 − 5·0 (−7·2)	6 2 6 (14)	24 13 16 (53)	167f (167)
63·557 Mar. 5	TS, C	4951a 4951b Centre	0·174 0·138	330·4 353·3	150·1 147·0 (146·1)	+ 1·3 + 0·7 (−7·2)	4 4 (8)	15 12 (27)	(0)
64·189 I. Mar. 6	TS, M	4951a 4951b Centre	0·277 0·219	301·9 309·2	151·3 147·5 (137·8)	+ 1·5 + 0·9 (−7·2)	17 6 (23)	43 19 (62)	(0)
65·518 Mar. 7	TS, C	4951a Centre	0·542	283·6	152·0 (120·3)	+ 1·2 (−7·2)	6 (6)	18 (18)	(0)
66·250 I. Mar. 8	TS, M	4951a 4952 4952 Centre	0·674 0·631 0·605	279·9 295·8 296·1	152·1 145·8 144·0 (110·7)	+ 1·3 + 10·1 + 9·4 (−7·2)	13 0 0 (13)	44 3 6 (53)	(0)
67·175 I.	TS, M	4951a 4952	0·814 0·802	276·9 285·6	152·2 149·6	+ 1·4 + 8·0	9 9	35 19	

Right half:

Greenwich Civil Time	Measurers	No. of Group, and Letter for Spot	Distance from Centre in terms of Sun's Radius	Position Angle from Sun's Axis	Longitude	Latitude	Area of UMBRA each Spot (and for Day)	Area of WHOLE each Spot (and for Day)	Area for each Group (and for Day)
1901. 67·175 I. Mar. 9	TS, M	4952 4952a Centre	0·782 0·767	288·8 287·7	147·0 146·0 (98·5)	+ 9·9 + 8·6 (−7·2)	6 20 (44)	17 42 (113)	(0)
68·493 Mar. 10	TS, C	4951a 4952a Centre	0·954 0·921	273·8 283·0	153·0 146·2 (81·1)	+ 1·5 + 9·0 (−7·2)	10 10 (20)	40 31 (71)	69f 121p (190)
Mar. 11 to Mar. 26		No	Spots	or	Faculæ				
85·197 I. Mar. 27	RF, M	Centre	0·936	78·7	153·1 (220·9)	+ 8·1 (− 6·7)	(0)	(0)	254 (254)
Mar. 28 to Apr. 2		No	Spots	or	Faculæ				
Apr. 3		No	photograph.						
Apr. 4 to May 18		No	Spots	or	Faculæ				
138·146 I. May 19	TS, M	4953 Centre	0·981	80·4	163·3 (241·4)	+ 9·0 (− 2·0)	45 (45)	133 (133)	181c (181)
139·460 May 20	TS, C	4953 Centre	0·881	78·8	163·2 (224·0)	+ 8·9 (− 1·9)	286 (286)	352 (352)	622c (622)
140·487 May 21	TS, C	4953 Centre	0·763	77·1	162·0 (210·6)	+ 8·6 (− 1·8)	201 (201)	564 (564)	(0)

The Groups of Spots are numbered in the order of their appearance. When there is no number in the third column, it is to be understood that there is a Facula unaccompanied by a Spot. The positions of Faculæ relative to the Spots with which they are associated are indicated by the letters *n, s, p, f, c*, denoting respectively north, south, preceding, following, concentric. The longitude and latitude of the centre of the disk are given in brackets. The Areas of Spots and Faculæ are expressed in millionths of the Sun's visible Hemisphere.

Group 4950, March 3–4. A small spot.
Group 4951, March 4–10. Two small spots, *a* and *b*; *b* has disappeared by March 7.
Group 4952, March 8–10. A number of spots, mostly very small, in an irregular cluster. The largest spot, *a*, is the last in the group, and alone remains on March 10.
Group 4953, May 19–31. A fine group consisting of a large regular spot, *a*, and a large composite spot *b*, following it. They are measured together on May 19–21. *b* has broken up by May 30.

Measures of Positions and Areas of Sun Spots and Faculæ on Photographs—*continued.*

Greenwich Civil Time	Measurers	No. of Group, and Letter for Spot	Distance from Centre in terms of Sun's Radius	Position Angle from Sun's Axis	Longitude	Latitude	Area of UMBRA for each Spot (and for Day)	Area of WHOLE for each Spot (and for Day)	Area for each Group (and for Day)
1901.				°	°	°			
141·428	TS, C	4953a	0·569	73·2	164·8	+ 8·1	102	282	
May 22		4953b	0·661	75·6	157·9	+ 8·2	250	417	(o)
		Centre			(198·0)	(−1·7)	(352)	(699)	
142·476	TS, C	4953a	0·368	61·8	165·1	+ 8·5	112	280	
May 23		4953b	0·483	67·9	157·3	+ 9·1	156	408	(o)
		Centre			(184·1)	(−1·6)	(268)	(688)	
143·445	TS, C	4953a	0·196	30·8	165·5	+ 8·3	107	235	
May 24		4953b	0·302	53·3	157·2	+ 9·1	164	349	(o)
		Centre			(171·3)	(−1·4)	(271)	(584)	
144·470	TS, C	4953a	0·216	320·4	165·8	+ 8·3	107	243	
May 25		4953b	0·183	2·5	157·3	+ 9·2	128	348	(o)
		Centre			(157·8)	(−1·3)	(235)	(591)	
145·220 I.	TS, M	4953a	0·348	297·8	164·7	+ 8·2	59	267	
May 26		4953b	0·252	317·6	156·6	+ 9·5	77	301	(o)
		Centre			(146·7)	(−1·2)	(136)	(568)	
146·465	TS, C	4953a	0·588	285·9	166·0	+ 8·3	98	234	
May 27		4953b	0·478	292·2	157·8	+ 9·4	149	298	(o)
		Centre			(131·3)	(−1·1)	(247)	(532)	
147·312 I.	TS, M	4953a	0·729	282·1	166·9	+ 8·1	43	297	
May 28		4953b	0·640	285·6	159·6	+ 9·1	60	358	(o)
		Centre			(121·1)	(−1·0)	(103)	(655)	
148·501	TS, C	4953a	0·888	280·3	166·3	+ 8·8	68	249	
May 29		4953b	0·825	281·5	159·1	+ 9·0	93	278	(o)
		Centre			(104·4)	(−0·8)	(161)	(527)	
149·123 I.	TS, M	4953a	0·944	279·0	166·4	+ 8·2	52	246	
		4953	0·904	281·9	160·1	+10·4	12	67	797c
		4953	0·895	279·8	159·1	+ 8·5	4	20	
		4953	0·893	278·5	158·9	+ 7·3	9	24	
May 30		Centre			(96·2)	(−0·7)	(77)	(357)	(797)
1901.						°			
150·187 I.	RF, M	4953a	0·995	278·6	165·9	+ 8·5	41	179	
		4953	0·976	281·3	158·9	+10·9	0	9	357c
		4953	0·974	277·5	158·6	− 7·2	0	9	
		4953	0·973	278·6	158·3	+ 8·2	0	16	
May 31		Centre			(82·1)	(−0·6)	(41)	(213)	(357)
June 1 and June 2		No	Spots	or	Faculæ				
153·168 I.	RF, M	4954	0·484	353·7	46·0	+28·4	0	1	
June 3		4954	0·481	354·5	45·6	+28·3	0	1	(o)
		Centre			(42·6)	(−0·2)	(0)	(2)	
June 4 to June 15		No	Spots	or	Faculæ				
166·201 I.	TS, M	4955	0·886	82·4	168·1	+ 7·4	9	26	
June 16		4955a	0·892	79·5	167·5	+ 9·9	29	109	726f
		Centre			(230·2)	(+1·3)	(38)	(135)	(726)
167·537	TS, C	4955	0·708	81·2	167·8	+ 7·3	0	15	
June 17		4955a	0·712	77·8	167·8	+ 9·7	21	107	(o)
		Centre			(212·5)	(+1·5)	(21)	(122)	
168·263 I.	TS, M	4955	0·576	78·8	168·2	+ 7·7	6	14	
June 18		4955a	0·583	75·9	168·0	+ 9·5	15	75	(o)
		Centre			(202·8)	(+1·6)	(21)	(89)	
169·188 I.	TS, M	4955	0·315	64·3	173·9	+ 9·5	4	11	
		4955	0·355	69·7	171·0	+ 8·7	6	20	
		4955	0·397	74·0	168·0	+ 7·8	4	14	(o)
June 19		4955a	0·408	68·7	168·0	+10·1	21	107	
		Centre			(190·6)	(+1·7)	(35)	(152)	

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The Areas of Spots and Faculæ are expressed in millionths of the Sun's visible Hemisphere.

Group 4954, June 3. A pair of very small spots.
Group 4955, June 16–26. A return of Group No. 4953. A regular spot, *a,* with a few small faint companions up to June 21, after which *a* remains alone.

Measures of Positions and Areas of Sun Spots and Faculæ on Photographs—*continued*.

Left half

Greenwich Civil Time.	Measurers.	No. of Group, and Letter for Spot.	Distance from Centre in terms of Sun's Radius.	Position Angle from Sun's Axis.	HELIOGRAPHIC Longitude.	HELIOGRAPHIC Latitude.	SPOTS. Area of UMBRA for each Spot (and for Day).	SPOTS. Area of WHOLE for each Spot (and for Day).	FACULÆ. Area for each Group (and for Day).
1901. 170·182 I. June 20	TS, M	4955	0·165	43·5	170·8	+ 8·6	0	1	
		4955a	0·217	48·3	168·0	+10·1	20	97	
		4955	0·244	52·0	166·2	+10·3	0	1	
		Centre			(177·4)	(+1·8)	(20)	(99)	(0)
171·192 I. June 21	TS, M	4955	0·142	322·1	169·1	+ 8·4	0	7	
		4955a	0·162	322·2	168·5	+10·2	20	95	
		4955	0·151	344·2	166·5	+10·3	0	3	
		Centre			(164·1)	(+1·9)	(20)	(105)	(0)
172·243 I. June 22	TS, M	4955a	0·351	294·8	169·0	+10·3	20	90	
		4956a	0·441	211·9	164·5	−20·0	1	4	
		Centre			(150·2)	(+2·0)	(21)	(94)	(0)
173·204 I. June 23	TS, M	4955a	0·538	286·1	169·0	+10·4	18	99	
		4956	0·567	231·3	165·2	−18·9	0	5	
		4956a	0·567	228·6	164·2	−20·1	4	22	
		4956b	0·538	228·1	162·4	−19·1	1	7	
		Centre			(137·4)	(+2·1)	(23)	(133)	(0)
174·174 I. June 24	TS, M	4955a	0·711	282·4	169·3	+10·3	12	66	
		4956a	0·707	237·8	164·1	−20·4	14	57	
		4956b	0·676	238·6	162·0	−18·9	9	36	
		Centre			(124·6)	(+2·2)	(35)	(159)	(0)
175·474 I. June 25	TS, M	4955a	0·891	280·4	170·2	+10·3	8	34	193p
		4956a	0·869	244·9	164·2	−20·3	0	71	}203c
		4956b	0·847	247·1	162·3	−17·9	0	30	
		Centre			(107·4)	(+2·4)	(8)	(135)	(396)
176·462 June 26	TS, M	4955a	0·969	280·1	170·0	+10·4	0	21	209f
		Centre			(94·3)	(+2·5)	(0)	(21)	(209)
June 27 to July 7		No	Spots	or	Faculæ				
188·517 July 8	RF, M	4957	0·480	92·5	266·2	+ 2·1	0	4	
		Centre			(294·8)	(+3·8)	(0)	(4)	(0)

Right half

Greenwich Civil Time.	Measurers.	No. of Group, and Letter for Spot.	Distance from Centre in terms of Sun's Radius.	Position Angle from Sun's Axis.	HELIOGRAPHIC Longitude.	HELIOGRAPHIC Latitude.	SPOTS. Area of UMBRA for each Spot (and for Day).	SPOTS. Area of WHOLE for each Spot (and for Day).	FACULÆ. Area for each Group (and for Day).
1901. July 9 to July 11		No	Spots	or	Faculæ				
192·242 I. July 12	RF, M		0·921	81·2	178·3	+ 9·8			158
		Centre			(245·5)	(+4·2)	(0)	(0)	(158)
193·446 I. July 13	RF, M		0·846	78·5	171·8	+12·0			229
		Centre			(229·5)	(+4·3)	(0)	(0)	(229)
July 14 to July 21		No	Spots	or	Faculæ				
202·189 I. July 22	TS, M	4958	0·891	281·8	177·0	+12·8	0	11	82
		Centre	0·991	92·3	31·9	− 1·6			163c
					(113·8)	(+5·1)	(0)	(11)	(245)
203·452 I. July 23	TS, M	4958	0·901	283·4	161·6	+14·3	0	10	174
		Centre	0·909	94·4	32·3	− 1·8			368f
					(97·1)	(+5·2)	(0)	(10)	(542)
204·381 I. July 24	TS, M	4958	0·802	95·9	32·1	− 1·6	0	5	280f
		Centre			(84·9)	(+5·3)	(0)	(5)	(280)
July 25 to Aug. 2		No	Spots	or	Faculæ				
Aug. 3		No	Photo	graph					

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The Areas of Spots and Faculæ are expressed in millionths of the Sun's visible Hemisphere.

Group 4956, June 22–25. A very small faint spot, *a*, on June 22. *a* has increased in size by June 23, and two other spots have formed near it. One of these, *b*, is seen also on the succeeding days.
Group 4957, July 8. A very small faint spot.
Group 4958, July 22–24. A small faint spot.

Measures of Positions and Areas of Sun Spots and Faculæ on Photographs—*continued.*

Greenwich Civil Time.	Measurers.	No. of Group, and Letter for Spot.	Distance from Centre in terms of Sun's Radius.	Position Angle from Sun's Axis.	HELIOGRAPHIC Longitude.	HELIOGRAPHIC Latitude.	SPOTS. Area of UMBRA for each Spot (and for Day).	SPOTS. Area of WHOLE for each Spot (and for Day).	FACULÆ. Area for each Group (and for Day).
1901. Aug. 4		No	Spots	or	Faculæ				
Aug. 5		No	Photograph						
Aug. 6 to Aug. 21		No	Spots	or	Faculæ				
233·471 Aug. 22	TS, M	Centre	0·883	63·1	358·4 (60·3)	+27·0 (+7·0)	(0)	(0)	165 (165)
Aug. 23 to Aug. 31		No	Spots	or	Faculæ				
243·158 I. Sept. 1	TS, M	Centre	0·938	297·5	7·8 (292·3)	+28·2 (+7·2)	(0)	(0)	89 (89)
Sept. 2 to Sept. 11		No	Spots	or	Faculæ				
254·193 I. Sept. 12	RF, M	4959; 4959; 4959; Centre	0·547; 0·548; 0·554	25·6; 26·4; 26·0	129·5; 129·0; 128·9 (146·5)	+36·4; +36·2; +36·7 (+7·2)	0; 0; 0 (0)	1; 4; 2 (7)	(0)
Sept. 13 to Oct. 6		No	Spots	or	Faculæ				
279·250 I. Oct. 7	TS, M	4960; Centre	0·710	109·1	133·4 (176·0)	− 8·8 (+6·3)	3 (3)	13 (13)	(0)
1901. 280·263 I. Oct. 8	TS, M	4960	0·519	119·9	135·5 (162·5)	− 9·3 (+6·3)	0 (0)	6 (6)	(0)
281·196 I. Oct. 9	TS, M	4960; 4960; 4960; 4960; Centre	0·366; 0·355; 0·375; 0·366	141·8; 139·3; 141·2; 137·3	136·9; 136·7; 136·4; 135·7 (150·2)	−·10·6; − 9·5; −10·9; − 9·5 (+6·2)	0; 0; 0; 0 (0)	1; 4; 1; 2 (8)	(0)
282·447 Oct. 10	TS, M	4960a; 4960b; Cernte	0·265; 0·245	194·0; 184·5	137·4; 134·8 (133·7)	− 8·8; − 8·0 (+6·1)	11; 7 (18)	42; 25 (67)	(0)
283·226 I. Oct. 11	TS, M	4960a; 4960b; Centre	0·362; 0·321	224·0; 218·9	138·1; 135·1 (123·4)	− 9·3; − 8·5 (+6·0)	6; 6 (12)	22; 16 (38)	(0)
284·240 I. Oct. 12	TS, M	4960a; 4960b; Centre	0·534; 0·492	242·3; 240·4	138·5; 135·0 (110·0)	− 9·1; − 8·6 (+6·0)	3; 1 (4)	10; 5 (15)	(0)
Oct. 13		No	Spots	or	Faculæ				
286·254 I. Oct. 14	TS, M	Centre	0·826	255·2	136·2 (83·4)	− 1·5 (+5·8)	(0)	(0)	192 (192)
Oct. 15 to Oct. 27		No	Spots	or	Faculæ				
300·483 Oct. 28	RF, M	4961a; 4961b; Centre	0·940; 0·952	97·7; 96·7	186·6; 184·6 (255·8)	− 5·6; − 4·9 (+4·6)	0; 0 (0)	23 } 102 } (125)	375c (375)

The Groups of Spots are numbered in the order of their appearance. When there is no number in the third column, it is to be understood that there is a Facula unaccompanied by a Spot. The positions of Faculæ relative to the Spots with which they are associated are indicated by the letters *n*, *s*, *p*, *f*, *c*, denoting respectively north, south, preceding, following, concentric. The longitude and latitude of the centre of the disk are given in brackets.
The Areas of Spots and Faculæ are expressed in millionths of the Sun's visible Hemisphere.

Group 4959, September 12. A cluster of very small spots.
Group 4960, October 7–12. A single small spot on October 7 and 8, and a compact cluster of very small spots on October 9. The group has changed its appearance by October 10, and has become two spots, *a* and *b*, both of which steadily diminish in size on the succeeding days.
Group 4961, October 28–November 1. Two spots, *a* and *b* on October 28. *b* has divided into two, *c* and *d* by October 29, and these have both disappeared by October 31, leaving *a* alone.

Measures of Positions and Areas of Sun Spots and Faculæ on Photographs—*continued*.

Greenwich Civil Time.	Measurers.	No. of Group, and Letter for Spot.	Distance from Centre in terms of Sun's Radius.	Position Angle from Sun's Axis.	HELIOGRAPHIC Longitude.	HELIOGRAPHIC Latitude.	SPOTS. Area of UMBRA for each Spot (and for Day).	SPOTS. Area of WHOLE for each Spot (and for Day).	FACULÆ. Area for each Group (and for Day).
1901. 301·193 I. Oct. 29	RF, M	4961a	0·873	99·1	186·6	− 5·6	10	45	485c
		4961c	0·898	97·0	183·3	− 4·3	5	41	
		4961d	0·903	97·9	182·7	− 5·1	6	26	
		Centre			(246·4)	(+4·5)	(21)	(112)	(485)
302·253 I. Oct. 30	RF, M	4961a	0·721	102·7	187·7	− 6·0	0	17	
		4961c	0·761	99·4	183·9	− 4·3	4	23	
		4961d	0·772	100·6	183·0	− 5·3	6	13	
		Centre			(232·5)	(+4·4)	(10)	(53)	(0)
303·527 Oct. 31	RF, M	4961a	0·491	110·1	188·1	− 5·9	6	21	
		Centre			(215·6)	(+4·3)	(6)	(21)	(0)
304·259 I. Nov. 1	RF, M	4961a	0·357	120·4	188·0	− 6·4	4	6	
		Centre			(206·0)	(+4·2)	(4)	(6)	(0)
Nov. 2 to Nov. 5		No	Spots	or	Faculæ				
309·285 I. Nov. 6	RF, M		0·869	264·4	199·4	− 3·3			221
		Centre			(139·7)	(+3·7)	(0)	(0)	(221)
310·243 I. Nov. 7	RF, M		0·951	265·4	198·5	− 3·1			114
		Centre			(127·1)	(+3·6)	(0)	(0)	(114)
311·253 I. Nov. 8	RF, M		0 966	263·8	188·2	− 5·1			214
		Centre			(113·8)	(+3·5)	(0)	(0)	(214)
Nov. 9 to Nov. 12		No	Spots	or	Faculæ				

Greenwich Civil Time.	Measurers.	No. of Group, and Letter for Spot.	Distance from Centre in terms of Sun's Radius.	Position Angle from Sun's Axis.	HELIOGRAPHIC Longitude.	HELIOGRAPHIC Latitude.	SPOTS. Area of UMBRA for each Spot (and for Day).	SPOTS. Area of WHOLE for each Spot (and for Day).	FACULÆ. Area for each Group (and for Day).
1901. 316·298 I. Nov. 13	RF, M	4962a	0·983	112·1	330·0	−21·1	34	107	738c
		Centre			(47·3)	(+2·9)	(34)	(107)	(738)
317·200 I. Nov. 14	RF, M	4962a	0·931	113·8	329·8	−20·9	29	118	507f
		Centre			(35·4)	(+2·8)	(29)	(118)	(507)
318·198 I. Nov. 15	RF, M	4962a	0·835	117·4	329·9	−20·9	19	131	503c
		4962	0·857	117·0	326·7	−22·4	0	2	
		4962	0·882	117·0	324·3	−22·2	0	4	
		4962	0·889	116·9	323·4	−22·3	0	8	
		Centre			(22·2)	(+2·7)	(19)	(145)	(503)
319·334 I. Nov. 16	RF, M	4962a	0·692	124·6	329·7	−21·1	25	134	352f
		4962	0·763	122·9	323·4	−22·7	0	6	
		Centre			(7·2)	(+2·5)	(25)	(140)	(352)
320·313 I. Nov. 17	RF, M	4962a	0·557	134·2	329·1	−20·6	30	120	
		Centre			(354·3)	(+2·4)	(30)	(120)	(0)
321·186 I. Nov. 18	RF, M	4962a	0·445	151·1	329·7	−20·6	28	125	
		Centre			(342·9)	(+2·3)	(28)	(125)	(0)
322·287 I. Nov. 19	RF, M	4962a	0·384	182·5	329·3	−20·3	26	132	
		Centre			(328·3)	(+2·2)	(26)	(132)	(0)
323·192 I. Nov. 20	RF, M	4962a	0·434	208·4	329·1	−20·3	24	121	
		Centre			(316·4)	(+2·1)	(24)	(121)	(0)

The Groups of Spots are numbered in the order of their appearance. When there is no number in the third column it is to be understood that there is a Facula unaccompanied by a Spot. The positions of Faculæ relative to the Spots with which they are associated are indicated by the letters n, s, p, f, c, denoting respectively north, south, preceding, following, concentric. The longitude and latitude of the centre of the disk are given in brackets.
The Areas of Spots and Faculæ are expressed in millionths of the Sun's visible Hemisphere.

Group 4962, November 13–25. A large well-defined regular spot, a, with a few very small faint companions on November 15 and 16.

Measures of Positions and Areas of Sun Spots and Faculæ on Photographs—*continued.*

Greenwich Civil Time.	Measurers.	No. of Group, and Letter for Spot.	Distance from Centre in terms of Sun's Radius.	Position Angle from Sun's Axis.	Longitude.	Latitude.	Area of UMBRA each Spot (and for Day).	Area of WHOLE each Spot (and for Day).	Area for each Group (and for Day).
1901. 324·209 I. Nov. 21	RF, M	4962a Centre	0·556	227·4	328·7 (302·9)	−20·3 (+1·9)	18 (18)	106 (106)	(0)
325·259 I. Nov. 22	RF, M	4962a Centre	0·706	238·7	329·0 (289·2)	−20·1 (+1·8)	17 (17)	110 (110)	(0)
326·510 Nov. 23	RF, M	4962a Centre	0·858	245·5	328·5 (272·6)	−19·9 (+1·7)	12 (12)	76 (76)	(0)
327·512 Nov. 24	RF, M	4962a Centre	0·948	248·5	328·8 (259·4)	−19·8 (+1·6)	5 (5)	71 (71)	(0)
328·206 I. Nov. 25	RF, M	4962a Centre	0·971 / 0·987	244·8 / 249·7	324·2 / 329·8 (250·3)	−24·0 / −19·8 (+1·4)	13 (13)	72 (72)	146 (146)
1901. Nov. 26 to Dec. 10		No	Spots or Faculæ						
344·175 I. Dec. 11	RF, M	Centre	0·959	112·9	327·7 (39·9)	−22·1 (−0·6)	(0)	(0)	63 (63)
Dec. 12 and Dec. 13		No	Spots or Faculæ						
347·202 I. Dec. 14	RF, M	Centre	0·963	296·6	71·9 (0·0)	+25·2 (−1·0)	(0)	(0)	149 (149)
Dec. 15 to Dec. 31		No	Spots or Faculæ						

The Groups of Spots are numbered in the order of their appearance. When there is no number in the third column it is to be understood that there is a Facula unaccompanied by a Spot. The positions of Faculæ relative to the Spots with which they are associated are indicated by the letters *n, s, p, f, c,* denoting respectively north, south, preceding, following, concentric. The longitude and latitude of the centre of the disk are given in brackets.
The Areas of Spots and Faculæ are expressed in millionths of the Sun's visible Hemisphere.

ROYAL OBSERVATORY, GREENWICH.

LEDGERS

OF

AREAS AND POSITIONS OF GROUPS OF SUN SPOTS

DEDUCED FROM THE MEASUREMENT

OF THE

SOLAR PHOTOGRAPHS

FOR EACH DAY IN THE YEAR

1901.

AREAS and HELIOGRAPHIC POSITIONS of GROUPS of SUN SPOTS DEDUCED FROM EACH DAY from the MEASUREMENTS of the PHOTOGRAPHS taken at the ROYAL OBSERVATORY, GREENWICH, at DEHRA DÛN IN INDIA, and at the ROYAL ALFRED OBSERVATORY, MAURITIUS, in the YEAR 1901.

NOTE.—The Greenwich Civil Time at which the photograph was taken is expressed by the month, day of the month (civil reckoning), and decimal of a day, reckoned from Greenwich Mean Midnight.

The Projected Area of the Umbræ and Whole Spots is the area as it is measured on the photograph, uncorrected for the effect of foreshortening, and expressed in millionths of the Sun's apparent disk.

The Column "Longitude from Central Meridian" gives the Mean heliographic longitude of the group, reckoned from the meridian passing through the centre of the Sun's disk at the moment of observation; longitudes west of the centre being reckoned as positive.

Dates for which no numbers are given indicate days for which no photographic Record is at present available.

Date. Greenwich Civil Time.	Projected Area of		Area for Group.		Mean Longitude of Group.	Mean Latitude of Group.	Longitude from Central Meridian.	Date. Greenwich Civil Time.	Projected Area of		Area for Group.		Mean Longitude of Group.	Mean Latitude of Group.	Longitude from Central Meridian.
	Umbra.	Whole Spot.	Umbra.	Whole Spot.					Umbra.	Whole Spot.	Umbra.	Whole Spot.			
Group 4948. *A very small faint spot.*								**Group 4951.** *Two small spots, a and b. b has disappeared by March 7.*							
1901. d Jan. 14·457	0	12	0	7	105·6	− 10·2	+19·7	1901. d Mar. 4·196	15	72	8	37	148·5	+ 1·4	−15·6
Means ...	...	...	0	7	105·6	− 10·2	...	5·557	16	54	8	27	148·7	+ 1·0	+ 2·6
								6·189	43	120	23	62	150·1	+ 1·3	+12·3
								7·518	10	30	6	18	152·0	+ 1·2	+31·7
								8·250	20	65	13	44	152·1	+ 1·3	+41·4
								9·175	10	41	9	35	152·2	+ 1·4	+53·7
								10·493	6	24	10	40	153·0	+ 1·5	+71·9
Group 4949. *A single spot which diminishes in size from day to day. It is not seen on February 10 or 11, but a very small spot is seen near its place on February 12.*								Means ...	...	...	11	38	150·94	+ 1·30	...
Feb. 4·275	13	39	19	58	100·5	− 8·4	−71·3	**Group 4952.** *A number of spots, mostly very small, in an irregular cluster. The largest spot, a, is the last in the group, and alone remains on March 10.*							
5·274	10	43	9	40	100·6	− 8·5	−58·0								
6·199	12	35	8	25	101·2	− 8·4	−45·3								
7·162	15	37	9	22	101·4	− 8·4	−32·4	Mar. 8·250	0	14	0	9	144·6	+ 9·6	+33·9
8·181	10	35	5	18	101·8	− 8·2	−18·5	9·175	44	99	35	78	147·1	+ 8·7	+48·6
9·307	5	20	2	10	102·4	− 8·1	− 3·1	10·493	8	24	10	31	146·2	+ 9·0	+65·1
10·235	0	0	0	0	...	...	...	Means ...	...	...	15	39	145·97	+ 9·10	...
11·331	0	0	0	0	...	...	...								
12·471	0	8	0	5	101·6	− 9·4	+37·7								
Means ...	...	...	6	20	101·36	− 8·49	...								
Group 4950. *A small spot.*								**Group 4953.** *A fine group consisting of a large regular spot a, and a large composite spot, b, following it. They are measured together on May 19-21. b has broken up by May 30.*							
Mar. 3·544	1	14	1	16	107·7	− 5·2	−64·8	May 19·146	18	53	45	133	163·3	+ 9·0	−78·1
4·196	7	18	6	16	107·7	− 5·0	−56·4	20·460	270	333	286	352	163·2	+ 8·9	−60·8
Means ...	...	...	4	16	107·70	− 5·10	...	21·487	520	728	201	564	162·0	+ 8·6	−48·6
								22·428	541	1082	352	699	160·7	+ 8·2	−37·3

AREAS and HELIOGRAPHIC POSITIONS of GROUPS of SUN SPOTS—*continued*.

Date. Greenwich Civil Time.	Projected Area of Umbra.	Whole Spot.	Area for Group. Umbra.	Whole Spot.	Mean Longitude of Group.	Mean Latitude of Group.	Longitude from Central Meridian.	Date. Greenwich Civil Time.	Projected Area of Umbra.	Whole Spot.	Area for Group. Umbra.	Whole Spot.	Mean Longitude of Group.	Mean Latitude of Group.	Longitude from Central Meridian.
Group 4953—*continued*.								**Group 4956.**							

Group 4956. A very small faint spot, *a*, on June 22. *a* has increased in size by June 23, and two other spots have formed near it. One of these, *b*, is seen also on the succeeding days.

Group 4953—*continued*.

Date.	Umbra.	Whole Spot.	Umbra.	Whole Spot.	Mean Long.	Mean Lat.	Long. C.M.
1901. d					°	°	°
May 23.476	481	1233	268	688	160.5	+ 8.8	−23.6
24.445	523	1129	271	584	160.5	+ 8.8	−10.8
25.470	460	1150	235	591	160.8	+ 8.8	+ 3.0
26.220	251	1048	136	568	160.4	+ 8.9	+13.7
27.465	418	899	247	532	161.4	+ 9.0	+30.1
28.312	151	961	103	655	162.9	+ 8.6	+41.8
29.501	167	543	161	527	162.5	+ 8.9	+58.1
30.123	57	262	77	357	164.3	+ 8.5	+68.1
31.187	9	53	41	213	164.7	+ 8.5	+82.6
Means ...	...	...	186	497	162.09	+ 8.73	...

Group 4954. A pair of very small spots.

Date.	Umbra.	Whole Spot.	Umbra.	Whole Spot.	Mean Long.	Mean Lat.	Long. C.M.
June 3.168	0	5	0	2	45.8	+28.4	+ 3.2
Means ...	...	..	0	2	45.8	+28.4	...

Group 4955. A return of Group 4953. A regular spot, *a*, with a few small faint companions up to June 21, after which *a* remains alone.

Date.	Umbra.	Whole Spot.	Umbra.	Whole Spot.	Mean Long.	Mean Lat.	Long. C.M.
June 16.201	34	123	38	135	167.6	+ 9.4	−62.6
17.537	32	179	21	122	167.8	+ 9.6	−44.7
18.263	34	144	21	89	168.0	+ 9.2	−34.8
19.188	64	279	31	152	168.8	+ 9.7	−21.8
20.182	40	193	20	99	168.0	+10.1	− 9.4
21.192	39	209	20	105	168.5	+10.1	+ 4.4
22.243	36	168	20	90	169.0	+10.3	+18.8
23.204	30	166	18	99	169.0	+10.4	+31.6
24.174	17	93	12	66	169.3	+10.3	+44.7
25.474	7	32	8	34	170.2	+10.3	+62.8
26.462	0	11	0	21	170.0	+10.4	+75.7
Means ...	...	...	19	92	168.75	+ 9.98	..

Group 4956.

Date.	Umbra.	Whole Spot.	Umbra.	Whole Spot.	Mean Long.	Mean Lat.	Long. C.M.
1901. d					°	°	°
June 22.243	2	6	1	4	164.5	−20.0	+14.3
23.204	9	56	5	34	164.0	−19.7	+26.6
24.174	34	133	23	93	163.3	−19.8	+38.7
25.474	0	103	0	101	163.6	−19.6	+56.2
Means ...	...	...	7	58	163.85	−19.78	...

Group 4957. A very small faint spot.

Date.	Umbra.	Whole Spot.	Umbra.	Whole Spot.	Mean Long.	Mean Lat.	Long. C.M.
July 8.517	0	6	0	4	266.2	+ 2.1	−28.6
Means ...	...	...	0	4	266.2	+ 2.1	...

Group 4958. A small faint spot.

Date.	Umbra.	Whole Spot.	Umbra.	Whole Spot.	Mean Long.	Mean Lat.	Long. C.M.
July 22.189	0	3	0	11	31.9	− 1.6	−81.9
23.452	0	8	0	10	32.3	− 1.8	−64.8
24.381	0	6	0	5	32.1	− 1.6	−52.8
Means ...	...	...	0	9	32.10	− 1.67	...

Group 4959. A cluster of very small spots.

Date.	Umbra.	Whole Spot.	Umbra.	Whole Spot.	Mean Long.	Mean Lat.	Long. C.M.
Sept. 12.193	0	11	0	7	129.0	+36.4	−17.5
Means ...	...	...	0	7	129.0	+36.4	...

AREAS and HELIOGRAPHIC POSITIONS of GROUPS of SUN SPOTS—*continued.*

Group 4960.

A single small spot on October 7 and 8, and a compact cluster of very small spots on October 9. The group has changed its appearance by October 10, and has become two spots, *a* and *b*, both of which steadily diminish in size on the succeeding days.

Date. Greenwich Civil Time.	Projected Area of		Area for Group.		Mean Longitude of Group.	Mean Latitude of Group.	Longitude from Central Meridian.
	Umbra.	Whole Spot.	Umbra.	Whole Spot.			
1901. d Oct. 7·250	4	19	3	13	133·4	− 8·8	−42·6
8·263	0	10	0	6	135·5	− 9·3	−27·0
9·196	0	15	0	8	136·4	− 9·8	−13·8
10·447	35	129	18	67	136·4	− 8·5	+ 2·7
11·226	22	72	12	38	136·8	− 9·0	+13·4
12·240	7	27	4	15	137·3	− 8·9	+27·3
Means ...	...	...	6	25	135·97	− 9·05	...

Group 4961.

Two spots, *a* and *b*, on October 28. *b* has divided into two, *c* and *d*, by October 29, and these have both disappeared by October 31, leaving *a* alone.

Date. Greenwich Civil Time.	Projected Area of		Area for Group.		Mean Longitude of Group.	Mean Latitude of Group.	Longitude from Central Meridian.
	Umbra.	Whole Spot.	Umbra.	Whole Spot.			
Oct. 28·483	0	78	0	125	185·0	− 5·0	−70·8
29·193	19	104	21	112	184·5	− 5·0	−61·9
30·253	13	71	10	53	184·9	− 5·1	−47·6

Group 4961—*continued.*

Date. Greenwich Civil Time.	Projected Area of		Area for Group.		Mean Longitude of Group.	Mean Latitude of Group.	Longitude from Central Meridian.
	Umbra.	Whole Spot.	Umbra.	Whole Spot.			
1901. d Oct. 31·527	10	36	6	21	188·1	− 5·9	−27·5
Nov. 1·259	7	12	4	6	188·0	− 6·4	−18·0
Means ...	...	...	8	63	186·10	− 5·48	...

Group 4962.

A large well-defined regular spot, *a*, with a few very small faint companions on November 15 and 16.

Date. Greenwich Civil Time.	Projected Area of		Area for Group.		Mean Longitude of Group.	Mean Latitude of Group.	Longitude from Central Meridian.
	Umbra.	Whole Spot.	Umbra.	Whole Spot.			
Nov. 13·298	13	40	34	107	330·0	−21·1	−77·3
14·200	21	87	29	118	329·8	−20·9	−65·6
15·198	21	158	19	145	329·3	−21·0	−52·9
16·334	36	199	25	140	329·4	−21·1	−37·8
17·313	49	201	30	120	329·1	−20·6	−25·2
18·186	49	204	28	125	329·7	−20·6	−13·2
19·287	47	244	26	132	329·3	−20·3	+ 1·0
20·192	43	215	24	121	329·1	−20·3	+12·7
21·209	31	179	18	106	328·7	−20·3	+25·8
22·259	24	156	17	110	329·0	−20·1	+39·8
23·510	13	78	12	76	328·5	−19·9	+55·9
24·512	3	46	5	71	328·8	−19·8	+69·4
25·206	4	24	13	72	329·8	−19·8	+79·5
Means ...	...	...	22	111	329·27	−20·45	...

ROYAL OBSERVATORY, GREENWICH.

TOTAL PROJECTED AREAS OF SUN SPOTS AND FACULÆ

FOR EACH DAY,

AND

MEAN AREAS AND MEAN HELIOGRAPHIC LATITUDE

OF

SUN SPOTS AND FACULÆ

FOR EACH ROTATION OF THE SUN

AND FOR THE YEAR

1901.

TOTAL PROJECTED AREAS of SUN SPOTS and FACULÆ for EACH DAY in the YEAR 1901.

The Projected Area is the Area as it is measured on the photograph, uncorrected for the effect of foreshortening, and expressed in millionths of the Sun's apparent disk.

The Greenwich Civil Time is expressed by the month, day of the month (civil reckoning), and decimal of a day, reckoned from Greenwich Mean Midnight.

Greenwich Civil Time.	Umbræ.	Whole Spots.	Faculæ.	Greenwich Civil Time.	Umbræ.	Whole Spots.	Faculæ.	Greenwich Civil Time.	Umbræ.	Whole Spots.	Faculæ.	Greenwich Civil Time.	Umbræ.	Whole Spots.	Faculæ.
1901 Jan. 1·2	0	0	0	**1901 Feb.** 18·2	0	0	0	**1901 Apr.** 6·2	0	0	0	**1901 May** 24·4	523	1129	0
2·2	0	0	0	19·2	0	0	0	7·2	0	0	0	25·5	460	1150	0
3·3	0	·0	0	20·3	0	0	0	8·2	0	0	0	26·2	251	1048	0
4·4	0	0	0	21·3	0	0	0	9·5	0	0	0	27·5	418	899	0
5·3	0	0	0	22·2	0	0	0	10·3	0	0	0	28·3	151	961	0
6·2	0	0	0	23·2	0	0	0	11·2	0	0	0	29·5	167	543	0
7·2	0	0	0	24·2	0	0	0	12·2	0	0	0	30·1	57	262	672
8·2	0	0	0	25·2	0	0	0	13·2	0	0	0	31·2	9	53	158
9·2	0	0	0	26·3	0	0	0	14·3	0	0	0				
10·5	0	0	0	27	No	photo	graph	15·5	0	0	0	**June** 1·5	0	0	0
11·2	0	0	0	28·3	0	0	151	16·4	0	0	0	2·5	0	0	0
12·2	0	0	0					17·5	0	0	0	3·2	0	5	0
13	No	photo	graph	**Mar.** 1·5	0	0	0	18·6	0	0	0	4·5	0	0	0
14·5	0	12	0	2·5	0	0	·0	19·5	0	0	0	5·2	0	0	0
15·5	0	0	0	3·5	1	14	280	20·5	0	0	0	6·1	0	0	0
16·4	0	0	0	4·2	22	90	173	21·5	0	0	0	7·2	0	0	0
17·3	0	0	0	5·5	16	54	0	22·2	0	0	0	8·4	0	0	0
18·2	0	0	0	6·2	43	120	0	23·6	0	0	0	9·5	0	0	0
19·2	0	0	0	7·5	10	30	0	24·5	0	0	0	10·5	0	0	0
20·5	0	0	0	8·3	20	79	0	25·5	0	0	0	11·5	0	0	0
21·2	0	0	0	9·2	54	140	0	26·5	0	0	0	12·5	0	0	0
22·2	0	0	0	10·5	14	48	141	27·5	0	0	0	13·2	0	0	0
23·5	0	0	0	11·5	0	0	0	28·5	0	0	0	14·5	0	0	0
24	No	photo	graph	12·2	0	0	0	29·2	0	0	0	15·4	0	0	0
25·5	0	0	0	13·2	0	0	0	30·5	0	0	0	16·2	34	123	613
26·5	0	0	0	14·2	0	0	0					17·5	32	179	0
27·3	0	0	0	15·2	0	0	0	**May** 1·4	0	0	0	18·3	34	144	0
28·3	0	0	0	16·2	0	0	0	2·2	0	0	0	19·2	64	279	0
29·5	0	0	0	17·2	0	0	0	3·5	0	0	0	20·2	40	193	0
30·5	0	0	0	18·2	0	0	0	4·5	0	0	0	21·2	39	209	0
31·3	0	0	0	19·2	0	0	0	5·5	0	0	0	22·2	39	174	0
				20·2	0	0	0	6·2	0	0	0	23·2	39	222	0
				21·2	0	0	0	7·5	0	0	0	24·2	51	226	0
Feb. 1·4	0	0	0	22·3	0	0	0	8·5	0	0	0	25·5	7	134	173
2·1	0	0	0	23·4	0	0	0	9·1	0	0	0	26·5	0	11	131
3·2	0	0	0	24·2	0	0	0	10·5	0	0	0	27·5	0	0	0
4·3	13	39	134	25·2	0	0	0	11·4	0	0	0	28·5	0	0	0
5·3	10	43	225	26·2	0	0	0	12·5	0	0	0	29·4	0	0	0
6·2	12	35	0	27·2	0	0	181	13·5	0	0	0	30·3	0	0	0
7·2	15	37	0	28·2	0	0	0	14·4	0	0	0				
8·2	10	35	0	29·5	0	0	0	15·4	0	0	0	**July** 1·2	0	0	0
9·3	5	20	0	30·2	0	0	0	16·5	0	0	0	2·2	0	0	0
10·2	0	0	0	31·2	0	0	0	17·5	0	0	0	3·2	0	0	0
11·3	0	0	0					18·2	0	0	0	4·5	0	0	0
12·5	0	8	0	**Apr.** 1·4	0	0	0	19·1	18	53	62	5·6	0	0	0
13·2	0	0	0	2·4	0	0	0	20·5	270	333	582	6·2	0	0	0
14·5	0	0	0	3	No	photo	graph	21·5	520	728	0	7·6	0	0	0
15·4	0	0	0	4·5	0	0	0	22·4	541	1082	0				
16·3	0	0	0	5·4	0	0	0	23·5	481	1233	0				
17·1	0	0	0												

TOTAL PROJECTED AREAS OF SUN SPOTS AND FACULÆ FOR EACH DAY IN THE YEAR 1901.

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TOTAL PROJECTED AREAS of SUN SPOTS and FACULÆ—*continued.*

Greenwich Civil Time.		Projected Area.		
		Umbræ.	Whole Spots.	Faculæ.
1901 July	8·5	0	6	0
	9·5	0	0	0
	10·5	0	0	0
	11·5	0	0	0
	12·2	0	0	125
	13·4	0	0	245
	14·2	0	0	0
	15·5	0	0	0
	16·6	0	0	0
	17·4	0	0	0
	18·5	0	0	0
	19·5	0	0	0
	20·5	0	0	0
	21·5	0	0	0
	22·2	0	3	121
	23·5	0	8	446
	24·4	0	6	328
	25·3	0	0	0
	26·3	0	0	0
	27·2	0	0	0
	28·2	0	0	0
	29·4	0	0	0
	30·4	0	0	0
	31·5	0	0	0
Aug.	1·2	0	0	0
	2·5	0	0	0
	3	No	photo	graph
	4·2	0	0	0
	5	No	photo	graph
	6·6	0	0	0
	7·5	0	0	0
	8·5	0	0	0
	9·5	0	0	0
	10·5	0	0	0
	11·4	0	0	0
	12·5	0	0	0
	13·5	0	0	0
	14·2	0	0	0
	15·5	0	0	0
	16·5	0	0	0
	17·5	0	0	0
	18·4	0	0	0
	19·5	0	0	0
	20·5	0	0	0
	21·5	0	0	0

Greenwich Civil Time.		Projected Area.		
		Umbræ.	Whole Spots.	Faculæ.
1901 Aug.	22·5	0	0	156
	23·5	0	0	0
	24·5	0	0	0
	25·4	0	0	0
	26·5	0	0	0
	27·5	0	0	0
	28·5	0	0	0
	29·2	0	0	0
	30·5	0	0	0
	31·3	0	0	0
Sept.	1·2	0	0	62
	2·4	0	0	0
	3·5	0	0	0
	4·5	0	0	0
	5·2	0	0	0
	6·5	0	0	0
	7·4	0	0	0
	8·6	0	0	0
	9·4	0	0	0
	10·2	0	0	0
	11·2	0	0	0
	12·2	0	11	0
	13·2	0	0	0
	14·5	0	0	0
	15·2	0	0	0
	16·5	0	0	0
	17·2	0	0	0
	18·5	0	0	0
	19·3	0	0	0
	20·2	0	0	0
	21·2	0	0	0
	22·6	0	0	0
	23·4	0	0	0
	24·3	0	0	0
	25·4	0	0	0
	26·5	0	0	0
	27·3	0	0	0
	28·2	0	0	0
	29·5	0	0	0
	30·5	0	0	0
Oct.	1·5	0	0	0
	2·2	0	0	0
	3·5	0	0	0

Greenwich Civil Time.		Projected Area.		
		Umbræ.	Whole Spots.	Faculæ.
1901 Oct.	4·2	0	0	0
	5·5	0	0	0
	6·1	0	0	0
	7·3	4	19	0
	8·3	0	10	0
	9·2	0	15	0
	10·4	35	129	0
	11·2	22	72	0
	12·2	7	27	0
	13·2	0	0	0
	14·3	0	0	218
	15·5	0	0	0
	16·2	0	0	0
	17·4	0	0	0
	18·2	0	0	0
	19·4	0	0	0
	20·4	0	0	0
	21·2	0	0	0
	22·2	0	0	0
	23·5	0	0	0
	24·2	0	0	0
	25·2	0	0	0
	26·2	0	0	0
	27·5	0	0	0
	28·5	0	78	242
	29·2	19	104	443
	30·3	13	71	0
	31·5	10	36	0
Nov.	1·3	7	12	0
	2·5	0	0	0
	3·2	0	0	0
	4·3	0	0	0
	5·2	0	0	0
	6·3	0	0	219
	7·2	0	0	71
	8·3	0	0	112
	9·2	0	0	0
	10·2	0	0	0
	11·3	0	0	0
	12·2	0	0	0
	13·3	13	40	193
	14·2	21	87	278
	15·2	21	158	503
	16·3	36	199	476

Greenwich Civil Time.		Projected Area.		
		Umbræ.	Whole Spots.	Faculæ.
1901 Nov.	17·3	49	201	0
	18·2	49	224	0
	19·3	47	244	0
	20·2	43	215	0
	21·2	31	179	0
	22·3	24	156	0
	23·5	13	78	0
	24·5	3	46	0
	25·2	4	24	71
	26·3	0	0	0
	27·3	0	0	0
	28·5	0	0	0
	29·2	0	0	0
	30·2	0	0	0
Dec.	1·2	0	0	0
	2·5	0	0	0
	3·3	0	0	0
	4·2	0	0	0
	5·2	0	0	0
	6·5	0	0	0
	7·2	0	0	0
	8·2	0	0	0
	9·3	0	0	0
	10·2	0	0	0
	11·2	0	0	36
	12·4	0	0	0
	13·2	0	0	0
	14·2	0	0	81
	15·5	0	0	0
	16·2	0	0	0
	17·2	0	0	0
	18·5	0	0	0
	19·2	0	0	0
	20·2	0	0	0
	21·2	0	0	0
	22·2	0	0	0
	23·2	0	0	0
	24·3	0	0	0
	25·2	0	0	0
	26·5	0	0	0
	27·2	0	0	0
	28·2	0	0	0
	29·5	0	0	0
	30·2	0	0	0
	31·2	0	0	0

MEAN AREAS of SUN SPOTS and FACULÆ, as measured on PHOTOGRAPHS taken at the ROYAL OBSERVATORY, GREENWICH, at DEHRA DÛN, INDIA, and in MAURITIUS, for each ROTATION of the SUN, from 1900 December 24 to 1901 December 14.

The Mean Areas have been formed by taking the Means of the Areas for each day of observation throughout each Rotation of the Sun, the Projected Areas being the Areas as measured on the photographs and expressed in millionths of the Sun's apparent disk, and the Areas corrected for foreshortening being expressed in millionths of the Sun's visible hemisphere.

The rotations adopted in the following table (which is in continuation of those for the years 1873–1900 printed in the Greenwich Observations for 1884 and succeeding years) correspond to the synodic rotation of the Sun, and the commencement of each is defined by the coincidence of the assumed prime meridian with the central meridian, the assumed prime meridian being that meridian which passed through the ascending node at mean noon on January 1, 1854, and the assumed period of the Sun's sidereal rotation being 25·38 days. The rotations adopted in the volumes of Greenwich Observations, 1877 to 1883, correspond, on the other hand, to the sidereal rotation of the Sun, the commencement of each being defined by the coincidence of the assumed prime meridian with the ascending node. The numeration of the rotations is in continuation of Carrington's series (*Observations of Solar Spots made at Redhill* by R. C. Carrington, F.R.S.), No. 1 being the rotation commencing 1853, November 9. The dates of commencement of the rotations are given in GREENWICH CIVIL TIME, reckoning from midnight.

No. of Rotation.	Date of Commencement of each Rotation.			No. of Days on which Photographs were taken.	Mean of Daily Areas.					
					Projected.			Corrected for Foreshortening.		
					Umbræ.	Whole Spots.	Faculæ.	Umbræ.	Whole Spots.	Faculæ.
632	1900	December	24·64	26	0·0	0·5	0·0	0·0	0·3	0·0
633	1901	January	20·98	27	2·4	8·0	13·	1·9	6·6	16·
634		February	17·32	26	6·9	22·	29·	5·0	16·	36·
635		March	16·65	26	0·0	0·0	7·0	0·0	0·0	9·8
636		April	12·93	27	0·0	0·0	0·0	0·0	0·0	0·0
637		May	10·18	28	138·	339·	53·	83·	231·	72·
638		June	6·39	27	14·	70·	34·	8·8	46·	42·
639		July	3·59	27	0·0	0·9	47·	0·0	1·1	54·
640		July	30·80	25	0·0	0·0	6·2	0·0	0·0	6·6
641		August	27·03	28	0·0	0·4	2·2	0·0	0·3	3·2
642		September	23·29	27	2·5	10·	8·1	1·4	5·4	7·1
643		October	20·58	27	5·2	29·	94·	5·5	31·	130·
644		November	16·88	27	9·7	51·	4·0	6·4	35·	7·7

MEAN AREAS of SUN SPOTS and FACULÆ, as measured on PHOTOGRAPHS taken at the ROYAL OBSERVATORY, GREENWICH, at DEHRA DÛN, INDIA, and in MAURITIUS, for the YEAR 1901.

The Mean Projected Areas are expressed in millionths of the Sun's apparent disk.

The Mean Areas corrected for foreshortening are expressed in millionths of the Sun's visible hemisphere.

Year.	No. of Days on which Photographs were taken.	Mean of Daily Areas.					
		Projected.			Corrected for Foreshortening.		
		Umbræ.	Whole Spots.	Faculæ.	Umbræ.	Whole Spots.	Faculæ.
1901	359	14·	41·	23·	8·6	29·	29·

MEAN HELIOGRAPHIC LATITUDE of SUN SPOTS, as measured on PHOTOGRAPHS taken at the ROYAL OBSERVATORY, GREENWICH, at DEHRA DÛN, INDIA, and in MAURITIUS, for each ROTATION of the SUN, from 1900 December 24 to 1901 December 14.

The numbers given in the accompanying table have been formed as follows :—

The Heliographic Latitude of each Spot for each day has been multiplied by its Area (corrected for foreshortening), and the sum of the products, for Spots North of the Sun's Equator, has been divided by the sum of the corresponding Areas to form Mean Heliographic Latitude of Spotted Area North of Equator; similarly for Spots South of the Equator. In forming the Mean Heliographic Latitude of entire Spotted Area, the algebraic sum of the products for Spots North and South of the Equator has been divided by the sum of the Areas; and for the Mean Distance from the Equator for all Spots, the numerical sum of the products, without regard to the sign of the latitude, has been similarly divided.

The Mean Areas have been formed by dividing the sum of the Daily Areas (corrected for foreshortening) by the number of days of observation for each Rotation of the Sun, and are expressed in millionths of the Sun's visible hemisphere.

No. of Rotation.	Date of Commencement of each Rotation.	No. of Days on which Photographs were taken.	Spots NORTH of the Equator.		Spots SOUTH of the Equator.		Mean Heliographic Latitude of entire Spotted Area.	Mean Distance from Equator of all Spots.
			Mean of Daily Areas.	Mean Heliographic Latitude.	Mean of Daily Areas.	Mean Heliographic Latitude.		
632	1900 Dec. 24·64	26	0·0	...	0·3	10·20	− 10·20	10·20
633	1901 Jan. 20·98	27	0·0	...	6·6	8·20	− 8·20	8·20
634	Feb. 17·32	26	15·	3·71	1·2	4·95	+ 3·04	3·81
635	Mar. 16·65	26	0·0	...	0·0	...	...	...
636	Apr. 12·93	27	0·0	...	0·0	...	...	...
637	May 10·18	28	231·	8·66	0·0	...	+ 8·66	8·66
638	June 6·39	27	38·	9·69	8·6	19·48	− 4·30	11·55
639	July 3·59	27	0·1	2·10	1·0	1·68	− 1·17	1·73
640	July 30·80	25	0·0	...	0·0	...	...	...
641	Aug. 27·03	28	0·3	36·37	0·0	...	+ 36·37	36·37
642	Sept. 23·29	27	0·0	...	5·4	8·85	− 8·85	8·85
643	Oct. 20·58	27	0·0	...	31·	14·91	− 14·91	14·91
644	Nov. 16·88	27	0·0	...	35·0	20·21	− 20·21	20·21

MEAN HELIOGRAPHIC LATITUDE of SUN SPOTS, as measured on PHOTOGRAPHS taken at the ROYAL OBSERVATORY, GREENWICH, at DEHRA DÛN, INDIA, and in MAURITIUS, for the YEAR 1901.

YEAR.	No. of Days on which Photographs were taken.	Spots NORTH of the Equator.		Spots SOUTH of the Equator.		Mean Heliographic Latitude of entire Spotted Area.	Mean Distance from Equator of all Spots.
		Mean of Daily Areas.	Mean Heliographic Latitude.	Mean of Daily Areas.	Mean Heliographic Latitude.		
1901	359	22·	8·59	6·6	16·27	+2·82	10·37

NOTE.—In the computations for forming the corresponding Tables given in the volumes for 1884 and 1885, the latitudes of the Spots were only taken to the nearest whole degree, the next higher whole degree being adopted whenever the fractional part of the latitude amounted to or exceeded ·5. Thus, under 8°, for example, would be included all Spots from 7°·5 to 8°·4, both inclusive; and the corresponding mean latitude should have been taken as 7°·95 instead of 8°. The Mean Heliographic Latitudes, therefore, both for Spots North and Spots South of the Equator, and the Mean Distances from the Equator of all Spots, both for the rotations and for entire years, require a correction of − 0°·05. The Mean Latitude of the entire Spotted Area requires the following correction :—

$$-0°·05 + \frac{\text{Mean Area N.} - \text{Mean Area S.}}{\text{Mean Area N.} + \text{Mean Area S.}}$$

These corrections have been applied in computing the Mean Heliographic Latitudes and Mean Distance from the Equator given in the above Tables for 1901, and in corresponding Tables for the years 1886 to 1900.