REPORT

OF THE

ASTRONOMER ROYAL

TO THE

BOARD OF VISITORS

OF THE

ROYAL OBSERVATORY, GREENWICH.

Read at the Annual Visitation of the Royal Observatory, 1908 *June* 3.

GREENWICH OBSERVATIONS, 1907.

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Read at the Annual Visitation of the Royal Observatory, 1908 *June* 3.

The Report here presented refers to the year from 1907 May 11 to 1908 May 10, and exhibits the state of the Observatory on the last-named day.

I.—Buildings and Grounds, Movable Property, and Library:—

The building of the new Storehouse for portable instruments, chronometer baskets and general stores, referred to in the last two Reports, was commenced at the end of January and having been pushed on rapidly is now practically completed. The wooden sheds formerly in use have been removed and the ground round the new Storehouse has been fenced in with unclimbable iron railing.

The covered passage with corrugated iron roof in front of the Old Observatory building required renewal and has been replaced by a new structure with glass roof. Granolithic cement has been substituted for the old stone pavement.

A circular railing round the shutter platform on the dome of the 28-inch refractor has been fixed to facilitate work on the dome, when necessary.

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A new greenhouse has been erected to replace the old one which was past repair.

The domes have been painted in the course of the year, and at the same time the 28-inch, Thompson and Astrographic Equatorials and the Altazimuth have also been painted.

The collection of Portraits (prints and photographs) in the Octagon Room has been reframed where necessary, the old frames being generally in a very bad state.

The principal movable instruments are thus distributed:—

At Greenwich—

Transits B, C, D, E, and the transit with axis view.

Altazimuth E.

Equatorials (6-inch).—Cooke No. 2, Simms No. 1, Hodgson, and Corbett. (The telescopes of the two last-named are mounted respectively on the Thompson and 28-inch Equatorials.)

Photoheliographs.—Nos. 2, 3, and 5. (The object glass of No. 5 has been lent to Professor Turner since the Eclipse Expedition of 1898.)

Detached Telescopes (on tripod stands).—One 4-inch (Simms No. 1), two 4-inch (R.O. Nos. 1 and 2), one $3\frac{1}{2}$-inch (R.O. No. 3).

Two Hilger Chronographs.

A single prism Spectroscope.

On loan—

Transit A, at the Cape Observatory.

Altazimuths.—A, at the Science Schools, South Kensington; B, at the Cape Observatory; D, to the Colonial Office for use of Major Watherston for Longitude Observations on the Gold Coast.

Equatorials.—Lee (6-inch), at the Hong Kong Observatory; Simms No. 2 (6-inch), lent to the Science and Art Department.

Photoheliographs.—No. 1, complete, at the Cape Observatory; No. 4, complete, at the Kodaikanal Observatory.

Detached Telescope.—4-inch (Simms' No. 2) lent to British Antarctic Expedition, 1907.

Clocks.—Dent No. 1916 and Dent No. 2013, at the Cape Observatory; Dent No. 2011, at the Kew Observatory; Dent No. 2010, at Devonport; and Arnold 2, at the University Observatory, Oxford.

Lent to the Royal Observatory for observation of Solar Eclipse, and still left here :—

Coelostat, with 16-inch Mirror, by the Government Grant Committee.

Double Spectroscope, Quartz and Flint, by Major E. H. Hills, R.E.

Heliostat, with 12-inch Mirror, by Major E. H. Hills, R.E.

Transit D and an observing hut were sent to Ascension on November 13 for the use of Captain Monro, R.N., in connection with the determination of the longitude of Ascension. They were returned to the Observatory on April 15.

A collection of historical and modern astronomical and meteorological instruments, models, chronometers and photographs, representative of the work of the Royal Observatory, has been prepared for the Franco-British Exhibition and is now ready for delivery as soon as arrangements have been made to receive this collection at the Exhibition.

The annual examination of the Library has been made as usual, the books on the shelves being compared with the catalogue. Only two books in the Astronomical Library and one in the Magnetic and Meteorological are missing in addition to fifteen reported last year, of which four have since been returned and two others have been accounted for.

II.—Astronomical Observations :—

Transit Circle.—At the end of 1906 October a system of two close vertical wires and one horizontal wire was inserted in each collimator in place of the system of inclined wires formerly in use.

The improved method of illuminating the field of view, which was applied to the Altazimuth last year and has proved satisfactory with that instrument, has now been applied to the transit circle, and has been in regular use since April 27. For purposes of comparison two clock-stars are observed each night with the old annular illumination, but are not used in the determination of clock-error, which depends on observations with the new central illumination only. Comparisons will also be available between the results for the fainter catalogue stars down to 9·0 magnitude in the years 1906–1907 with the annular illumination and subsequently with the central illumination, which may throw light on the question of the magnitude equation for the fainter stars. The adjustment of the reversion prism will also be much facilitated with the central illumination, as it was found difficult with the annular illumination to ensure that the whole of the emergent annular pencil would reach the eye after passing through the reversion prism.

The Sun, Moon, planets, and fundamental stars have been regularly observed on the meridian as in previous years. The other stars observed are taken from a working catalogue of stars of 9·0 magnitude and brighter between the limits + 24° to + 32° of N. declination, serving as reference stars for the Oxford Astrographic Zones.

The number of observations with the Transit Circle from 1907 May 11 to 1908 May 10 is as follows:—

Transits	8,723
Determinations of Collimation error	288
Determinations of Level error	513
Circle observations	7,960
Determinations of nadir point (included in the number of circle observations)	498
Reflexion observations of stars (similarly included)	238

The transits are completely reduced (so as to exhibit Mean R.A. 1910·0) to 1908 April 20 and Apparent R.A. is formed to May 3.

The circle observations are completely reduced to 1908 April 20.

The investigation of personal equations is complete for 1907.

The R–D discordance has been investigated for 1907.

The corrections for variation of latitude for 1907 were received from Professor Albrecht on May 3, and have not yet been applied.

The value of the colatitude determined from observations made in 1905 with Bessel's refractions was 38°·31′·21″·70, and in 1906 with Pulkowa refractions 38°·31′·21″·67.

The correction to the tabular obliquity of the ecliptic from solar observations in 1906 is − 0″·09. The discordances between the result of summer and winter solstices is −0″·01, indicating that the mean of the observed distances from the pole to the ecliptic is apparently too great by 0″·005. The apparent correction from observations of the sun to right ascensions of clock stars is − 0ˢ·058.

The apparent correction for discordance between the nadir observations and stars observed by reflexion in 1907 is − 0″·24. The values found since 1892 range from − 0″·20 to − 0″·41. Four-fifths of this quantity is applicable to observations of the nadir in forming the zenith point on days when no reflexion observations of stars are obtained, and since 1897 January 1 the value − 0″·25 has been adopted for this correction.

Observations of level and nadir have been made when practicable three or more times a day. The following are the mean values of the diurnal changes of level and nadir for 1907, and for the nine years 1897 to 1905, observations within three hours of noon, 6 p.m., midnight, and 6 a.m., respectively, being grouped together :—

	Diurnal Changes of Level.				Diurnal Changes of Nadir.			
	Noon.	6 p.m.	Midnight.	6 a.m.	Noon.	6 p.m.	Midnight.	6 a.m.
1907	+ 0″·13	0″·00	+ 0″·18	...	+ 0″·17	0″·00	+ 0″·14	...
1897–1905	+ 0·25	0·00	+ 0·21	+ 0·37	+ 0·14	0·00	+ 0·12	+ 0·11

The correction for R − D discordance found for 1907 is + 0″·050 + 0″·576 *sin* Z.D., the co-efficient of *sin* Z.D. agreeing sensibly with the adopted value (+ 0″·600).

The mean error of the Moon's tabular place (computed from Hansen's lunar tables with Newcomb's corrections) for 1906 is $-0^s\cdot383$ in R.A., and $-0''\cdot15$ in N.P.D., deduced from 82 observations. These are equivalent to a mean error of $-5''\cdot91$ in longitude and $+0''\cdot37$ in E.N.P.D.

The mean error of the Moon's tabular place for 1907 is $-0^s\cdot401$ in R.A. deduced from 104 observations.

The Second Nine-Year Catalogue, Epoch 1900, which was terminated at the end of 1905, will be divided into two sections—Part I., Fundamental and Zodiacal Stars; Part II., Astrographic Reference Stars. The copy for press for Part I. has been sent to the printers, and a large section of Part II. will shortly be sent.

Altazimuth.—The new system of central illumination described in the last Report has been used throughout the year and has proved satisfactory. Arrangements have now been made to permit a few clock stars and standard polar stars to be observed with the old annular illumination for the purpose of comparing the results of the two methods.

The instrument has been used as a reversible transit-circle in the meridian in four positions during the year, the positions being changed regularly every two months. Observations of the Sun, Moon, planets, and the fundamental stars contained in the National Ephemerides and in Newcomb's Fundamental Catalogue, have been made throughout the year.

The instrument has been used regularly for extra-meridian observations of the Moon during the first and last quarters of the lunation.

The observations of the crater Mösting A, started in 1905, are being continued, whenever it is observable. The observations of transits serve to connect the observations of the first and second limbs made before and after full moon respectively; and the observations of zenith distances will, in combination with similar observations now being made at the Cape Observatory, serve to determine the parallax of the Moon.

Mösting A has also been observed with the transit-circle when practicable.

The following observations have been made with the Altazimuth during the year:—

	No. of Observations.
Collimation, Level, and Azimuth	234, 406, and 118 respectively.
Nadir: Reflexion observations of stars	346 and 131 ,,
Flexure	6
R.A. and N.P.D. of Sun, planets, and stars (in meridian)	1,398 and 1,240 ,,
R.A. and N.P.D. of Moon (in meridian)	81 and 62 ,,
R.A. and N.P.D. of Mösting A	43 and 43 ,,
Azimuth and Zenith distance of stars (extra meridian)	112
Azimuth and Zenith distance of Sun and planets (extra meridian)	11
Azimuth and Zenith distance of Moon (extra meridian)	26

The altazimuth observations are reduced to the end of 1907. Of the observations for 1908, the transits and the meridian zenith distances are reduced to April 12. The extra-meridian observations are completely reduced to 1907 December 31.

The R − D discordance has been investigated separately for each two months of the year during which the instrument remained in one position. The direct observations have also been compared in reversed positions of the instrument with the positions given in Newcomb's Fundamental Catalogue. It has been decided to employ the R − D correction deduced from the reflexion observations alone, instead of using the constant part of the correction as given by the comparison with Newcomb's places.

The observations of the Moon both in and out of the meridian seem very satisfactory, as shown by the agreement between the two instruments—transit-circle and altazimuth.

The values for the mean error of the Moon's Tabular Place from the altazimuth observations in 1907 are—

Moon's limb in Meridian	− 0ˢ·36
Mösting A in Meridian	− 0ˢ·35
Moon's limb, Extra-meridian	− 0ˢ·42

The following table shows the number of days on which observations of the Moon were obtained with the transit-circle and altazimuth, respectively, in the year ending 1908 May 10 :—

Time of Moon's Meridian Passage.	Transit Circle.		Altazimuth.		
			Meridian.		Extra Meridian.
	Limb.	Mösting A.	Limb.	Mösting A.	Limb.
h. h.					
1–2 G.M.T.	0		0		0
2–3	0		0		3
3–4	1		0		4
4–5	5		1		6
5–6	9		4		5
6–9	25	14	22	10	3
9–12	22	20	24	18	0
12–15	20	13	16	8	0
15–18	15	9	11	7	0
18–19	1		3	0	1
19–20	3		0		2
20–21	4		0		1
21–22			0		1
22–23			0		0

The total number of observations of the Moon is 105 with the transit-circle and 107 with the altazimuth, viz. :—81 in the meridian and 26 extra-meridian.

Taking both instruments, observations of the Moon have been obtained on 128 days during the year.

Reflex Zenith Tube.—During the year, 1,545 double observations and 44 single observations have been obtained, the number of different stars observed being 85.

The enlarged scheme of observation mentioned in the last report has been in operation throughout the year. The following table shows the number of observations obtained in each month in each group of stars since 1906 November, when

the new scheme was introduced. In this table the principal groups denoted by A and B are each divided into two halves (A_1, A_2, B_1, B_2); a and b are the subsidiary groups introduced to strengthen the connection between the principal groups. It will be seen that the overlap of the groups is sufficient to obtain a very good connection between them.

Group.		A_1.	A_2.	a.	B_1.	B_2.	b.
Limiting R.A.		$4^h\ 59^m$–$7^h\ 6^m$	$7^h\ 6^m$–$9^h\ 26^m$	$12^h\ 19^m$–$14^h\ 22^m$.	$17^h\ 28^m$–$19^h\ 27^m$.	$19^h\ 27^m$–$22^h\ 34^m$.	$0^h\ 12^m$–$1^h\ 44^m$.
1906	November	17	27	—	12	11	—
	December	46	45	—	10	15	4
1907	January -	25	30	16	7	3	1
	February -	24	47	27	8	—	—
	March -	31	84	76	15	—	—
	April -	—	5	36	40	—	—
	May -	—	—	24	67	—	—
	June -	—	—	19	65	1	—
	July -	—	—	—	158	10	—
	August -	—	—	—	87	90	—
	September	5	—	—	141	266	2
	October -	33	1	—	25	92	21
	November	19	2	—	7	13	5
	December	10	4	—	10	9	11
1908	January -	25	11	50	14	4	5
	February -	29	67	58	6	—	—
	March -	—	38	22	8	—	—
	April -	—	2	42	15	—	—

Group B_1 contains the bright stars, β and γ Draconis and ι^2 Cygni, which are observed throughout the year.

A beginning has been made of the discussion of the observations from 1903 onwards, with a view to determining the variation of latitude. One of the principal

difficulties in the discussion arises from the fact that the scale value of the instrument varies very appreciably from night to night, owing to minute alterations in the distance between the mercury surface and the object glass. This distance can with care be adjusted to within about 0·01 inch by means of the focussing rod; but an error in adjustment of that amount would introduce a wholly inadmissible error in the deduced zenith distances for stars at a considerable distance from the centre of the field, amounting to $\pm 0''\cdot56$ in the case of β Draconis, which is at a distance of $53\frac{1}{2}'$ from the zenith. It is accordingly necessary either to determine the scale-value each night indirectly from the observations themselves, or to select and weight the observations used in the discussion so as to eliminate any error due to its uncertainty. The distribution of the stars observable with the instrument is peculiarly unfavourable from this point of view, being very unsymmetrical with regard to the zenith. Thus, in the group denoted above by B_1, there are 15 north stars and only 4 south stars. It is clear that the discussion of the observations will be a far from simple problem, but, so far as can be ascertained, the difficulties are not insurmountable.

Clocks and Chronographs.—The Sidereal Standard clock was taken away by E. Dent & Co. for repair on July 16, and was returned on July 22.

Equatorials.—During the year ending 1908 May 10, 29 disappearances and 4 reappearances of stars occulted by the Moon have been observed by one or more observers. 14 of the stars of which the disappearance was observed were below the limit of magnitude adopted by the Nautical Almanac, viz., 7·0.

The 28-inch Refractor. — The working catalogue of double stars contains primarily the pairs discovered by G. W. Hough, and is completed by selected pairs from the various catalogues of Struve, Otto Struve, Burnham, Hussey, and Aitken. The number of nights on which measures were made was 105, as compared with 86 in the previous year. The measures made consist of—

—	Hough.	Miscellaneous.
Double stars under 0″·5 separation - - -	17	64
„ „ between 0″·5 and 1″·0 separation - -	17	78
„ „ „ 1″·0 „ 2″·0 „ - -	20	81
„ „ over 2″·0 separation - - - -	81	130

Measures were made of κ Pegasi on 15 nights, of δ Equulei on 13 nights, and of 70 Ophiuchi on 16 nights.

Equatorial and polar diameters of Jupiter have been measured first with the filar micrometer, and then with the double-image micrometer on the same nights. The 28-inch is well adapted for this, as the breech end is arranged for either direct or diagonal view by means of a plane mirror which can be readily inserted or withdrawn. The bi-filar was mounted for direct view, and the double-image micrometer for diagonal view with the plane mirror. Complete sets of measures were made on 17 nights; they are in continuation of those mentioned in the last Report, the series being intended to supplement similar measures made during the opposition of 1895–1896. The diameters of the satellites were measured on two nights with the filar micrometer.

Thompson Equatorial. — The 30-inch mirror was re-silvered in November. As described in the last report it is held rigidly in its cell by means of 12 wedges of lignum vitæ. This method has proved quite satisfactory in fixing the mirror, but as the wedges are liable to distort the mirror slightly, it is proposed to substitute adjustable cast-iron blocks, shaped to fit the steel supporting band round the edge of the mirror, the pressure being applied by screws passing through the cell, so that the strain may be adjusted as required. The blocks and screws have been prepared in readiness for the next occasion when the mirror is taken out of its cell for re-silvering.

With the 26-*inch Refractor*, 31 photographs of Neptune and its satellite have been taken on 16 nights. The occulting shutter has been used as in previous oppositions.

In connection with the observations of Saturn's and Jupiter's distant satellites, 27 photographs of Saturn on 17 nights, and 7 of Jupiter on 6 nights, have been taken with the 26-inch Refractor, for determination of their positions with reference to the stars used in the reductions of the observations of the satellites.

A new, faint, and very distant satellite of Jupiter has been discovered by Mr. Melotte with the 30-inch Reflector. This object was first noted on a photograph of Jupiter's sixth and seventh satellites taken on February 28, and its existence was confirmed by a photograph taken on the preceding night. It was afterwards found on six photographs which had been taken previously, the earliest being on January 27, and it was subsequently photographed on March 27, 31, April 3, 24.

From the 12 photographs obtained in the three months from January 27 to April 24 it would appear that the object discovered is a satellite of Jupiter very much more distant from the planet than the sixth and seventh satellites. It is perhaps not quite so faint as the seventh satellite.

With the 30-*inch Reflector*, the following photographs have been taken:—

16	photographs	of	Saturn and Satellite	IX	on 16	nights.
38	,,		Jupiter ,,	VI	,, 30	,,
22	,,		,, ,,	VII	,, 21	,,
12	,,		,, ,,	VIII	,, 12	,,
140	,,	54 minor planets.				
15	,,	Comet *d* 1907 on 13 nights.				
12	,,	,, *e* 1907 ,, 8 ,,				

In addition to the photographs of Comet *d* 1907 mentioned above, 17 photographs with long exposure for the tail were taken, several of which are of great interest.

Besides these, 4 long exposures were made in an unsuccessful search for Halley's comet, and a few miscellaneous plates were taken, chiefly for instrumental adjustments.

During the year the following photographs have been measured and the results published in the *Monthly Notices R.A.S.*:—

Jupiter, Satellite VIII. 1908	11	photographs.
Saturn, Satellite IX. 1907	16	,,
Neptune and Satellite 1906–7	29	,,
Comet *d* 1906	17	,,
,, *e* 1906	7	,,
,, *g* 1906	6	,,
,, *d* 1907	15	,,
31 minor planets, 1906	78	,,

The following photographs have been measured and partly reduced:—

38 minor planets	104	photographs taken in 1907.
Comet *e* 1907	12	,,

Astrographic Equatorial.—Work with this instrument is still confined in the main to replacing Chart plates which, though satisfactory in other respects, are, owing to slight photographic defects, unsuitable for reproduction of enlarged prints.

Altogether 177 photographs have been taken on 74 nights. Of these 49 have been rejected: 25 because the exposure was unfinished owing to cloud, or because they did not reach the standard in showing faint stars; 17 owing to faults in the plates and for miscellaneous causes; and 7 were accidentally broken before development.

The remaining 128 plates are made up as follows:—

Chart plates (exposure 40^m)	94
Catalogue plates (exposure 6^m, 3^m, and 20^s)	5
Plates for adjustment	3
Comet *d* 1907; Fields round Jupiter, Saturn, and minor planets	26

Positives have been made and passed for the 192 plates, which cover the zones 75°–78°, and for 109 plates in zones between 79° and the Pole. There remain 15 chart plates having slight defects which render them unsuitable for reproduction. It is proposed to photograph these fields again in the course of this year.

The Constants for 22 plates in Zone 72° mentioned in last year's Report have been computed, thus completing the determination of the Constants of the plates for the Zones 72° to the Pole with the final values of the star-places given in the Greenwich Second Nine-year Catalogue for 1900. These have been included in the Introduction to Volume II. of the Greenwich Astrographic Catalogue which has been prepared during the year, and this volume, containing 98,738 stars, has been published. This completes the work of the Greenwich Section of the Astrographic Catalogue as far as the publication of the measured rectangular co-ordinates and of the data necessary to convert them into Right Ascension and Declination is concerned. Besides these the Constants of the 568 plates given in Volume I. have been revised during the year. The Standard Co-ordinates of the Reference stars have been corrected by addition of the differences due to the adoption of the final star places in the Greenwich Second Nine-year Catalogue for 1900, instead of those previously used, and the plate constants have been recomputed with these revised co-ordinates. This work is done as far as the determination of scale-value (constants *a* and *e*).

The conversion of the co-ordinates of stars which are in Carrington's Catalogue into Right Ascension and Declination has been begun.

The completion of the counting of the stars on the Chart plates (exposure 40^m) for the Greenwich Section 64° N. Dec. to the Pole was reported last year, and the results as compared with those for exposures 20^s, 3^m, and 6^m as well as with the corresponding numbers from the Bonn Durchmusterung are summarised in the following table. Column (1) for each exposure gives the number of stars shown in duplicate, *i.e.*, on both of the overlapping plates, and column (2) the total number shown on *one or other* of the overlapping plates. For the Zones 73° to 79° inclusive the actual numbers counted have been multiplied by the factor 1·26 for column (1) of the 40^m exposure and by 1·35 for column (2) to allow for personality due to changes in the counting staff as explained in the last report.

Zone.	No. of Square Degrees.	Number in B.D.		Number shown on Photographs.								Ratios $\frac{40^m}{6^m}$	
		9^m·0 and brighter.	Total Number.	Exposure 20^s		Exposure 3^m		Exposure 6^m		Exposure 40^m			
				(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
64°	155	743	1,932	1,890		8,727		8,954		45,281		5·1	
65°	149	762	2,005	1,473	2,476	6,355	9,220	7,109	9,239	39,401	47,080	5·5	5·1
66°	144	632	1,744	1,294	2,155	6,486	9,491	7,213	9,505	38,631	45,333	5·4	4·8
67°	138	624	1,577	1,201	1,849	6,149	9,516	7,236	9,586	39,188	44,489	5·4	4·6
68°	132	529	1,470	1,277	2,103	5,915	9,611	8,106	9,939	41,036	45,627	5·1	4·6
69°	126	547	1,363	1,418	2,435	6,497	10,447	8,598	10,745	41,520	46,897	4·8	4·4
70°	120	536	1,375	1,400	2,448	6,491	10,601	8,735	10,954	37,780	41,888	4·3	3·8
71°	114	446	1,267	1,313	2,385	6,257	10,738	8,288	10,939	34,245	39,168	4·1	3·6
72°	108	442	1,148	1,249	2,247	5,585	9,770	7,860	10,090	31,859	35,001	4·1	3·5
73°	102	377	1,091	1,168	1,987	5,592	8,857	7,424	9,122	32,739	38,568	4·4	4·2
74°	96·2	374	1,040	1,085	1,763	5,303	8,543	6,936	8,744	30,190	35,081	4·4	4·0
75°	90·1	351	933	1,051	1,833	5,346	9,149	7,122	9,379	24,893	28,211	3·5	3·0
76°	84·0	340	945	1,076	1,829	5,202	8,647	6,877	8,852	25,463	28,890	3·7	3·3
77°	77·9	320	946	1,097	1,772	4,939	8,324	6,607	8,532	27,125	31,567	4·1	3·7
78°	71·8	266	847	1,010	1,720	4,736	7,933	6,225	8,123	28,319	33,421	4·5	4·1
79°	65·6	297	801	1,001	1,598	4,623	7,236	6,101	7,468	29,416	33,993	4·8	4·6
80°	59·6	255	810	829	1,243	3,787	5,827	4,971	5,984	20,805	22,910	4·2	3·8
81°	53·4	205	850	680	1,042	3,101	4,743	4,048	4,862	17,386	18,675	4·3	3·8
82°	46·6	181	740	531	894	2,716	4,341	3,598	4,456	14,142	15,090	3 9	3·4
83°	41·0	176	686	485	764	2,332	3,651	3,020	3,712	11,731	12,770	3·9	3·4
84°	34·7	146	548	441	665	2,035	3,117	2,620	3,191	9,607	10,351	3·7	3·2
85°	28·1	117	409	316	501	1,643	2,409	2,094	2,493	6,724	7,392	3·2	3·0
86°	22·3	90	361	246	392	1,042	1,680	1,393	1,723	4,933	5,559	3·5	3·2
87°	15·6	53	203	142	215	664	938	755	1,092	2,871	3,166	3·8	2·9
88°	9·7	45	153	79	135	321	529	417	678	1,751	2,075	4·2	3·1
89°	3·3	8	40	12	32	132	187	161	237	554	605	3·4	2·6
Totals	2087·9	8,862	25,284	23,764	38,373	111,976	174,232	142,468	178,599	637,590	719,088	4·5	4·0
Number per square degree		4·24	12·1	11·4	18·4	53·6	83·4	68·2	85·5	305·4	344·4		
Ratios	-	1	2·9	2·7	4·3	12·6	19·7	16·1	20·2	71·9	81·1		

It is to be noted that in the measurement of the Catalogue plates a star, which is so faint that it is shown only by the 6^m exposure on the better of the two plates, is not included. In counting the Chart plates all the stars seen on one of the plates only are included. For this reason, and also in some degree because the presence of an image taken with 6^m exposure is a guide to the position of a 3^m image, the numbers in columns (2) under the headings 3^m and 6^m tend to become equalized.

The reproduction of enlarged prints of the Chart plates has been carried on throughout the year. The reproductions of the four Zones 71°, 72°, 73°, and 74° have been completed, and in Zones 75°, 76°, 77°, and 78° the reproductions have been made of the plates from 12^h to 24^h and from 0^h to 4^h. The total number of photographic prints made during the year is about 11,650, reproducing on double scale 196 plates. Altogether reproductions have been made of 822 plates since the work was begun in 1904, being nearly three-quarters of the total of 1,149 plates which make up the Greenwich Section.

The calculation of the perturbations of Halley's Comet, referred to in last year's Report, has been carried on by Mr. Cowell and Mr. Crommelin, and the quantities required for the determination of the time of the next perihelion passage have nearly all been computed. Some further examination of the circumstances of the close approaches of the comet to Jupiter in 1834 and 1837 is, however, required, as the perturbations were then very considerable. The work appears to indicate that Pontécoulant's value of the mean daily motion in 1835 is too small by $0''\cdot05$; this change would bring the next perihelion passage a month earlier than the date given by him. The most probable date appears to be 1910 April 8, subject to slight correction.

Search was made for the comet last winter with the 30-inch reflector, but without success. The search will be resumed in the autumn, a search ephemeris having been prepared based on the results of the computation of perturbations.

The calculations undertaken by Mr. Crommelin of the perturbations for past returns of the comet with the object of verifying the conjectural identifications by Dr. Hind (*Monthly Notices R.A.S.* Vol. X.) were not carried out at the Royal

Observatory, but may be properly mentioned in this Report. The perturbations have been carried back to 760, and Dr. Hind's identifications confirmed with three exceptions (1223, 912, and 837). In each period of the comet, the disturbing forces were computed for forty different epochs. A method brought into working order by Mr. Cowell enables one hundred additional epochs to be dispensed with. Mr. Crommelin undertook the whole of the computations and the discussion of the recorded appearances. Papers on the subject have been published in the *Monthly Notices R.A.S.* for December, January, March, April, and May.

The drawing from photographs of the Eclipse of 1905, with the Astrographic 13-inch refractor, which was referred to in last Report, has been completed by Mr. Wesley, and he is now revising in regard to minor details the whole series of drawings of the Eclipses of 1898, 1900, 1901, and 1905 by comparison with the original negatives.

III.—Heliographic Observations:—

In the year ending 1908 May 10, photographs of the Sun were taken in all upon 212 days, the Thompson photoheliograph being in regular use for this work throughout the year, except for a few days in 1907 November, when the equatorial was being repainted. During this interval the Dallmeyer photoheliograph, which has throughout remained on its own mounting on the South Terrace of the New Building, was used; and once or twice a supplemental photograph has been taken with the Dallmeyer on days when the Thompson has also been used. In all, the Thompson photoheliograph was used alone on 207 days, the Dallmeyer alone on 2 days, and both instruments were used on 3 days.

Of the photographs taken, 436 have been selected for preservation, besides 16 with double images of the Sun for the determination of zero of position angles. Supplementary photographs have been received from Kodaikánal Observatory, India, up to 1908 April 3; from Dehra Dûn, India, through the Solar Physics Committee, up to 1908 March 18; and from Mauritius (one photograph) up to 1907 January 26.

The Greenwich series of photographs, supplemented by the photographs from the two Indian observatories, was complete for the year 1907, with the exception of one day, 1907 January 26, which has been supplied from Mauritius. The record for 1908 is complete up to March 18, the date of the last photograph received from Dehra Dûn, which came to hand on May 2.

The complete photographic record at present in hand, for the year 1907, is made up from the following sources:—

Greenwich	185 days.
Dehra Dûn	151 „
Kodaikánal	28 „
Mauritius	1 „
Total	365 „

The measurement of these photographs is complete to the end of 1907, except in the case of the photographs from Dehra Dûn, which have only been measured as far as 1907 May 30.

The work of measuring the photographs from Dehra Dûn has been temporarily suspended in consequence of the discovery of a serious error in the orientation of the spider-lines. It was found during the preparation of the copy for press of the Ledger of Spot-Groups for the year 1906, that the latitudes of spot-groups as determined from the Dehra Dûn photographs showed considerable discordances as compared with each other and with the latitudes derived from the Greenwich and Kodaikánal photographs. It had been assumed in the reduction of the Dehra Dûn photographs that the spider-lines were truly oriented, and that no correction for zero of position angle was required; it having been the rule at Dehra Dûn for many years past to set the position-circle of the photoheliograph to the zero as determined by allowing the diurnal motion to carry a spot or the Sun's limb along the horizontal wire, and to test the accuracy of this adjustment at short intervals. It would appear that attention to this rule has been relaxed in recent years; the Superintendent of Trigonometrical Surveys reporting, on inquiry being made, that the photoheliograph at Dehra Dûn was much out of adjustment, and that it had probably been so for a long time. He reports that the photoheliograph has now been placed in adjustment, and that since 1908 February 20 a second exposure has been given to the photographs, the driving clock being stopped for a little more than two minutes between the exposures, so that part of a second image of the Sun is secured from which the true west point of the plate can be determined.

In consequence of this discovery the printing of the Heliographic Results for 1906, which had been commenced, has been suspended. An attempt has been made to obtain materials for determining the amount of the error of orientation by comparison of Dehra Dûn and Greenwich photographs taken on the same day. But it is found that the error of position-angle on the Dehra Dûn photographs, which appears to be due to an error of adjustment of the equatorial, cannot satisfactorily be corrected in this way, and it will be necessary to substitute photographs taken at Kodaikánal or Mauritius for those taken at Dehra Dûn; involving the measurement and calculation of the positions of spots for 155 fresh photographs for 1906 and for 60 for 1907.

The numeration of the spot-groups from a preliminary examination of the solar photographs, and the publication, month by month, in *The Observatory* of the lists of the spot-groups thus numbered, with their descriptions and rough estimations of their areas and mean heliographic longitudes and latitudes, have been continued during the year, the last list published being that of the groups of 1908 January, appearing in *The Observatory* for 1908 May. This numeration of the spot-groups has also been communicated, month by month, to the Director of the Kodaikánal Observatory.

The solar activity as shown in the numbers and areas of sun-spots has undergone some remarkable fluctuations during the past year, 1907 as a whole having been a more prolific year than 1906, though not attaining the average activity of 1905. May 1907 was a very quiet month, and but for the appearance of one very fine group June would have presented an almost blank record. With July a period of recovery commenced, and the sun's activity increased steadily until the end of September and suffered very little abatement during the three last months of 1907. Beside the appearance of several large groups easily visible to the naked eye, there was a marked tendency to form long processions of groups following each other at short intervals along a parallel of solar latitude. The three opening months of 1908 showed a great decline in activity, the sun being entirely free from spots on 1908 January 28, but a revival set in with the first days of April, followed by a decline at the beginning of May. During the year ending 1908 May 10 the number of great groups readily visible to the naked eye has been considerably smaller than in the preceding year, there having been only seven fairly conspicuous groups and about as many more that could be just detected by keen sight. The faculæ, though still numerous, seem to have been less extensive than in the previous year.

The volume of *Photo-Heliographic Results, 1874 to 1885*, in which the heliographic results for those 12 years are rendered uniform with those for 1886 and the succeeding years, has been completed and published during the past year.

IV.—Magnetic Observations :—

The variations of magnetic declination, horizontal force and vertical force, and of earth currents, and accompanying eye observations of absolute declination, horizontal force and dip, have been made as in former years.

The regular determinations of magnetic declination, horizontal force and dip, have been made with the new declinometer, the Gibson deflexion instrument, and the Airy dip circle mounted in the Magnetic Pavilion.

The magnetic reductions for 1907 are completed to the following stages :—

The eye observations of the declination and horizontal and vertical force magnets are completely reduced, and the hourly ordinates of the photographic registers are read off and tabulated. The temperature of the magnet basement at every hour has been read from the Richard thermograph sheets, and the daily and hourly means have been taken. The declination, dip, and deflexion observations made in the Magnetic Pavilion are completely reduced.

The principal results for the magnetic elements for 1907 are as follows :—

Mean declination - - -	15°.59′·8 West.
Mean horizontal force - - -	4·0195 (in British units). 1·8533 (in metric units).
Mean dip (with 3-inch needles) -	66°.56′.4″.

These results depend on observations in the Magnetic Pavilion, and are free from any disturbing effect of iron in the Observatory buildings.

In 1907 there was one day of great magnetic disturbance, and there were 16 of lesser disturbance. Traces of the photographic curves for these days will be published in the annual volume. The calculation of diurnal inequalities from five typical quiet days in each month, selected in concert with M. Moureaux and Dr. Chree, has been continued.

The list of "quiet" or "normal" days is also communicated for publication by the International Committee on Terrestrial Magnetism in their "quiet day" circular.

V.—Meteorological Observations :—

The meteorological instruments are all in good order. The registration of atmospheric pressure, temperature of the air and of evaporation, pressure and velocity of the wind, rainfall, sunshine, and atmospheric electricity has been continuously maintained. Cloud observations in connection with the international balloon ascents have been made with a Fineman nephoscope.

New springs were fitted to the pressure plate of the Osler anemometer during the summer, the arrangement of the strong and weak sets of springs being modified by successive experiments with a view to simplifying the determination of mean pressure. These experiments occupied a considerable time, and since trials in the actual position of the instrument were liable to be interfered with by wind, a period of nearly four months elapsed between their commencement in the workshop of Messrs. Troughton and Simms and the final adoption of the new scale values. In this connection it may be remarked that the summer was exceptionally windy.

On 1908 January 1 a new rain gauge was brought into use in the Magnetic Pavilion enclosure in accordance with a request from Dr. H. R. Mill, Director of the British Rainfall Organisation. It is of the standard Meteorological Office pattern, differing from the Snowdon pattern in having a diameter of 8 inches instead of 5 inches, the receiving surface being 1 foot from the ground. The primary object was to give a more accurate comparison with other stations of the Rainfall Organisation ; and, in addition to this, the utility of a check on the readings of the standard gauge has already been demonstrated.

The meteorological reductions are in the following state :—The observations of barometer, thermometers, anemometers, rain-gauges, and sunshine recorder (corrected, where necessary, for instrumental error) are reduced up to the present time. On the photographic sheets all time-scales are laid down, and the hourly ordinates are read out and completely reduced to the end of 1908 April. The table of principal changes of the wind is complete for 1907.

The mean temperature for the year 1907 was 49°·4, or 0°·2 below the average for the 65 years 1841–1905.

During the twelve months ending 1908 April 30 the highest temperature in the shade (recorded on the open stand in the Magnetic Pavilion enclosure) was 82°·7, on September 25. On the same day the highest temperature in the Stevenson

screen in the Magnetic Pavilion enclosure was 82°·6, and in the Observatory Grounds 80°·2.

The lowest temperature of the air recorded in the year was 17°·9 on January 6 and 12. During the winter there were 47 days on which the temperature fell below 32°·0, being nine less than the average number.

The mean daily horizontal movement of the air in the year ending 1908 April 30 was 291 miles, which is 9 miles above the average of the preceding 40 years. The greatest recorded daily movement was 771 miles, on December 14, and the least 52 miles, on September 12. The greatest recorded pressure of the wind was 22·7 lbs. on the square foot, on December 14, and the greatest hourly velocity 46 miles, on the same day.

During the year 1907 Osler's anemometer showed an excess of 31 revolutions of the vane in the positive direction N., E., S., W., N., excluding the turnings which are evidently accidental.

The number of hours of bright sunshine recorded during the 12 months ending 1908 April 30, by the Campbell-Stokes instrument, was 1,386 out of 4,472 hours during which the Sun was above the horizon, so that the mean proportion of sunshine for the year was 0·310, constant sunshine being represented by 1.

The rainfall for the year ending 1908 April 30 was 23·14 inches, being 0·98 inches less than the average of the 65 years 1841–1905. The number of rainy days was 167.

Owing to several changes in the staff of four computers attached to the Magnetic and Meteorological Branch, the progress made with the last two investigations required to complete the discussions for past years mentioned in the Report for 1906 has not been as rapid as had been hoped for. As reported last year (1) and (2) are already completed, and the discussions (3) and (4) are in the following state :—

(3) The 40 years' record of the Robinson anemometer, 1867–1906, is ready for press, with the exception of a few tables in which it was hoped to show a mean relation between the velocity recorded by the Robinson instrument and the pressure registered by the Osler anemometer mounted on the same building.

(4) Daily rainfall has been entered on forms ready for discussion, for the strictly homogeneous portion of the period contemplated, but no decision has been made as to the advisability, or the method, of including the earlier years from 1841 to 1861, during which several changes of system were introduced, nor as to the closing date of the period under discussion.

VI.—Printing and Distribution of Greenwich Publications :—

The copies of the volume of Greenwich Observations for 1905 were distributed in July 1907.

The printing of the volume of Greenwich Observations for 1906 is just on the point of completion, and copies are expected very shortly.

It is to be observed that the volume for 1906 will not contain the Photoheliographic Results, which will be included with those for 1907 in the 1907 volume. This is owing to the discovery of certain errors in the orientation of the Dehra Dûn Solar Photographs for 1906, as well as 1907, necessitating a serious duplication of measuring and computing work.

The printing of the volume for 1907 has been commenced with the Altazimuth Observations, a good part of which has been printed. The observations of Zenith Distance with the Transit Circle have also been sent to the printer. The Rates of Chronometers and Watches for 1907–8 have been printed and distributed.

The following special publications have been completed during the year, and the copies have just been received and are being distributed :—

Astrographic Catalogue, Greenwich Section, Vol. II.

Heliographic Results, 1874 to 1885.

Measures of Photographs of Eros for Determination of the Solar Parallax.

The printing of the Greenwich Second Nine-Year Catalogue (1897 to 1905) has been commenced.

VII.—Chronometers, Time Signals, and Miscellaneous :—

The number of Government marine chronometers and watches now at the Observatory is 389, viz., 255 box chronometers, 23 pocket chronometers, 68 chronometer watches, and 43 hack watches. In addition to these there are, at

the Observatory, 27 hack watches on trial for purchase, and also 8 box chronometers and 2 watches belonging to the Indian Government.

In the year ending 1908 May 10, the average daily number of chronometers and watches being rated was 589, the total number received was 1,298, the total number issued was 1,415, and the number sent for repair 575. These include 11 box chronometers, and 2 deck-watches for the Indian Government.

For the annual trial of chronometers, which lasted 29 weeks with a range of temperature from 45° to 106°, 28 chronometers were sent in. During the trial 13 were rejected because the difference between one week's rate and the next exceeded 12 seconds. Of the remaining 15 chronometers, 9 were purchased for the Navy and 6 for the Indian Government. There is a serious falling off in the performance of the chronometers as well as in the number submitted for trial.

A competitive trial of pocket chronometers took place concurrently with the trial of box chronometers, and under the same conditions as regards length of trial and temperature—trials in position as for chronometer watches being included. Of the 8 pocket chronometers sent in, 3 were purchased for the Navy.

For the annual trial of chronometer watches, lasting 16 weeks and including trials in the oven and in positions, 156 watches were entered, of which 43 were classified, and of these 32 were purchased for the Navy. Among the watches classified were 10 with centre seconds dials, of which 8 were purchased. There were 17 "Karrusel" or "Tourbillon" watches classified, of which 15 were purchased. The performance of the watches this year shows an improvement on that of last year and fairly comes up to the average of previous years.

It has been arranged that in future pocket chronometers and chronometer watches shall be tested together under the same conditions for the trial.

The next trial of box chronometers will commence on June 20, and of pocket chronometers and chronometer watches on August 1.

The Greenwich time-ball was not raised on one day (December 14), owing to the violence of the wind. On June 6 the clips failed to hold the ball, which fell about two minutes too early. It was raised again and dropped correctly.

On December 3 the Greenwich Mean Solar clock (Dent 2012) gave a false signal 30^s before the hour, which dropped the Greenwich time-ball. It was raised again and dropped at 14^h. The 13^h signal left the Observatory correctly.

The automatic drop of the Deal time-ball failed on 6 days owing to interruptions of the telegraphic communications. On 1 day the ball was not raised owing to the violence of the wind. On 10 days the current was too weak to drop the ball; but on 3 of these occasions the attendant dropped the ball correctly by hand. On July 3, through inadvertence, the apparatus at Deal was not set correctly, and the ball did not drop.

The return signal from Devonport failed on 61 days (of which 9 were Sundays), and could not be observed on 31 days (of which 15 were Sundays) owing to interruptions by telegraph signals. The apparent error of the clock signal (after daily correction of the clock by aid of a time signal from Greenwich, on the plan described in the Report for 1885) did not exceed $0^s \cdot 2$ on 88 per cent. of the 273 days of observation, and did not exceed $0^s \cdot 5$ on 96 per cent. On 12 occasions it exceeded $0^s \cdot 5$, but never exceeded $1^s \cdot 0$. The average error for the year was $\pm 0^s \cdot 14$.

The return signal from Portsmouth failed on 50 days (of which 26 were Sundays), and could not be observed on 21 days (of which 15 were Sundays) owing to interruption by telegraph signals. The apparent error of the clock (corrected in the same manner as the Devonport clock) did not exceed $0^s \cdot 2$ on 75 per cent. of the 295 days of observation, did not exceed $0^s \cdot 5$ on 98 per cent., and was between $0^s \cdot 5$ and $1^s \cdot 0$ on 6 days. The average error for the year was $\pm 0^s \cdot 18$.

Return signals from Portland have been received regularly from 1907 May 29. The apparent error of the clock (corrected in the same manner as the Devonport clock) did not exceed $0^s \cdot 2$ on 70 per cent. of the 216 days of observation, did not exceed $0^s \cdot 5$ on 90 per cent., and exceeded $0^s \cdot 5$ on 21 days, being over one second on three of these. The average error for the period was $\pm 0^s \cdot 23$.

The automatic signals from the Westminster clock have been received regularly since June 6, previous to which date the clock was under repair. On 8 days the signal failed, and on one day it was interrupted by telegraph signals. Its apparent error was not greater than $0^s \cdot 5$ on 32 per cent. of the days of observation, not greater than $1^s \cdot 0$ on 63 per cent., not greater than $2^s \cdot 0$ on 93 per cent., not greater than $3^s \cdot 0$ on 99 per cent., and exceeded $3^s \cdot 0$ on only two occasions. Owing to an accumulation of snow on the hands, the clock stopped at $5^h \cdot 50^m$ a.m. on 1908 January 8. It was re-started at noon.

In connection with a telegraphic determination of the longitude of Ascension, referred both to Greenwich and the Cape Observatories, which the Hydrographer had arranged to undertake, Captain Monro, R.N., and Lieutenant Gibson, R.N., were attached to the Observatory from September 16 to October 14 to practise observations with a portable transit under the guidance of Mr. Hollis and Mr. Harold Christie, and to obtain determinations of their personal equations referred to the Standard Observer with the Transit-Circle. Mr. R. T. Pett, of the Cape Observatory, who was on leave in England at that time, was also attached to the Observatory from September 16 to October 4 for the determination of his personal equation with the Transit-Circle so as to connect the Standard Observers at Greenwich and the Cape in view of the proposed longitude determination Greenwich–Ascension–Cape, which connects the Cape and Greenwich indirectly through Ascension. A further determination of personal equation will be made by Captain Monro on his return to England in July after the longitude operations.

The Eastern Telegraph Company kindly gave the free use of their cable from Porthcurno to the Cape *viâ* Ascension on Saturday and Sunday nights during February, and Mr. Judd, Electrician-in-Chief of the Company, with his staff gave every assistance in making arrangements for signalling through the great length of cable from Porthcurno to Ascension, 4,211 nautical miles, without a relay. Preliminary experiments with an artificial cable at the Eastern Telegraph Company's London office were made on September 27 and October 9, and it was found that by making special arrangements satisfactory signals could be obtained through this length of cable with a syphon recorder.

By arrangement with the Hydrographer, Captain Simpson, R.N., took charge of the work in connection with the transmission of signals between Greenwich and Ascension *viâ* Porthcurno during February, exchanges of signals being made on seven nights during the month. The accordance of the times of transmission between Porthcurno and Ascension is very satisfactory, showing that the signals recorded through this great length of cable can be read off with considerable accuracy, and the individual results for longitude on the separate nights also accord well.

It is proposed to undertake this year a telegraphic determination of the longitude of Malta, for which provision has been made in the Navy Estimates.

VIII.—Personal Establishment:—

The permanent staff at the present time is constituted as follows, the names in each class being arranged in alphabetical order:—

Chief Assistants—Mr. Cowell, Mr. Eddington.

Assistants—Mr. Bryant, Mr. Crommelin, Mr. Hollis, Mr. Lewis, Mr. Maunder, Mr. Thackeray.

Clerical Assistant—Mr. Outhwaite.

Established Computer (Higher Grade)—Mr. Davidson.

Established Computers—Mr. Bowyer, Mr. Burkett, Mr. Cullen, Mr. Edney, Mr. Evans, Mr. Furner, Mr. Melotte, Mr. Stevens, Mr. Storey, Mr. Witchell.

At the end of April Mr. John Storey was appointed Assistant at the Royal Observatory, Edinburgh, having been successful in the competitive examination for the post. It has been arranged with Professor Dyson that Mr. Storey shall take up his duties at Edinburgh on May 25.

Mr. Cowell and Mr. Eddington have the general superintendence of all the work of the Observatory. Mr. Maunder is charged with the heliographic photography and reductions. Mr. Lewis has charge of the clocks, time signals, and chronometers, and of the 28-inch equatorial. Mr. Thackeray superintends the meridian work and miscellaneous astronomical computations. Mr. Hollis superintends the photographic mapping of the heavens, the measurement of the plates, and the computations for the Astrographic Catalogue. Mr. Crommelin has charge of the altazimuth and of the observations of occultations. Mr. Bryant superintends the magnetic and meteorological observations and reductions. Mr. Outhwaite acts as responsible accountant officer, has charge of the library, manuscripts and stores, and conducts the official and general correspondence. Mr. Davidson has charge of the Thompson equatorial and the measurement of the photographs taken with it. In particular, he has been employed on the discussion of the photographs of Eros taken in the opposition of 1900–1901 for the determination of the Solar parallax. Mr. Bowyer, Mr. Cullen, Mr. Edney, and Mr. Furner assist Mr. Lewis, Mr. Thackeray, Mr. Bryant, and Mr. Crommelin respectively. Mr. Witchell and Mr. Storey, under Mr. Thackeray's direction, undertake respectively the reduction of the meridian zenith distances observed with the transit circle and the reflex zenith tube, and of the transit observations with the transit circle. Mr. Melotte and Mr. Stevens are engaged alternate weeks, under Mr. Hollis's direction, in the reproduction of the enlarged prints of the astrographic chart. At other times Mr. Melotte assists in the measurement and reduction of the Thompson photographs, and Mr. Stevens in the astrographic work. Mr. Evans also assists Mr. Hollis in the measurement and reduction of the astrographic plates. Mr. Burkett assists Mr. Outhwaite.

The number of Supernumerary Computers at present employed in the Observatory is 26; of these, 8 are attached to the Astronomical Branch, 3 to the Chronometer and Time Signal Branch, 7 to the Astrographic Branch including the Thompson equatorial measures and reductions, 3 to the Heliographic Branch, 4 to the Magnetic and Meteorological Branch, and 1 to the Clerical Branch.

A foreman of works, with 2 carpenters and 2 labourers; a foreman mechanic, with 2 assistants; a gate-porter, 2 messengers, a watchman, a gardener, a labourer, and a charwoman are also attached to the Observatory.

The whole number of persons regularly employed at the Observatory is 62.

IX.—General Remarks:—

The past year has been signalized by the discovery of a new Satellite of Jupiter—very faint and very distant from its primary—as the result of close scrutiny of the series of photographs of Jupiter's Sixth and Seventh Satellites, which have been taken at each opposition since their discovery at Lick Observatory in 1905. The circumstance that this very faint object has been detected at Greenwich and found on no less than 12 photographs taken since January 27, when it first came within the field covered by the plates (taken to show the Seventh Satellite in the centre), is a testimony to the assiduity with which the observing staff watch for every favourable opportunity for a long exposure, and also to the suitability of the Greenwich climate for the observation of very difficult objects, such as faint satellites and close double stars.

The work of photographic revision of the Greenwich section of the Astrographic Chart is practically completed, and the Astrographic Equatorial now becomes available for further work. In view of the circumstance that the re-observation of the reference stars down to 9·0 magnitude for the Oxford section, between 24° and 32° N. declination has been undertaken at Greenwich, it would be appropriate to complete the photography of this region, which has been carried out, as far as the Catalogue plates are concerned, at Oxford, by taking the corresponding Chart plates at Greenwich. The statistics which would be furnished by counts of the stars on these plates (40^m exposure), as compared with those for the Catalogue plates (6^m, 3^m, and 20^s exposure) and for the Bonn Durchmusterung respectively, would be of special interest, as this region passes through two rich portions of the Milky Way, thus contrasting with the region round the Pole covered by the Greenwich photographs. The counts of stars on

these last have now been completed, the statistics being summarised in a table given in this Report, p. 16.

The danger which threatened the Observatory from the working of the large generating station, half a mile due north of the meridian instruments, has been to a great extent averted by the action of the London County Council last October in accepting, as the basis of a working agreement for two years, the recommendations of the Special Committee appointed to report on the question. Further experience has shown that as regards vibration, the observation of difficult double stars with the 28-inch telescope is not prejudicially affected under present conditions of working the completed portion of the generating station. But, on the other hand, there are decided indications that the heated gases from the two completed chimneys interfere with the meridian observations of north stars, rendering the images very unsteady immediately above the chimneys. A reduction in their height, as suggested by the Committee, is very desirable.

W. H. M. CHRISTIE.

Royal Observatory, Greenwich,
1908 May 25.