

R E P O R T
OF THE
ASTRONOMER ROYAL
TO THE
BOARD OF VISITORS
OF THE
ROYAL OBSERVATORY, GREENWICH.

Read at the Annual Visitation of the Royal Observatory, 1928 June 2.

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The President of the Royal Society - - - SIR ERNEST RUTHERFORD.

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Nominated as Fellows of the Royal Astronomical Society.	{	DR. J. W. L. GLAISHER. DR. E. B. KNOBEL. SIR GERALD LENOX-CONYNGHAM. PROF. H. F. NEWALL. MR. J. H. REYNOLDS. COL. F. J. M. STRATTON.
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REPORT OF THE ASTRONOMER ROYAL
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Read at the Annual Visitation of the Royal Observatory, 1928 June 2.

The Report here presented refers to the year from 1927 May 11 to 1928 May 10, and exhibits the state of the Observatory on the last-named day.

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

The external painting of the Thompson Dome, the covered passage and conservatory in the front court, the Central Store for publications and the sheds at the southern end of the Observatory was completed on November 5. The Astrographic Dome was recovered with papier-maché between November 4 and December 24. The room under the Shuckburgh Dome has been converted into a satisfactory chamber for the apparatus for the transmission of time signals to Rugby. Most of the structural alterations had been made at the date of the last report but the wiring and painting were completed later. The upper computing room is being improved by the introduction of a wooden partition separating it from the staircase leading to the Astrographic Dome.

At Abinger, the arrangements for water supply referred to in the last report were completed in July. Protection against frost was fitted to the supply pipes from the water-tower in February. The cylinders of one of the engines were taken to Chatham and overhauled at the end of March.

The principal movable instruments are thus distributed :—

At Greenwich—

Transits B, C, D, and E.—Transit B is fitted with an impersonal Micro-meter.

Altazimuths D and E.

Equatorials (6-inch).—Cooke No. 2, Simms No. 1.

Photoheliographs Nos. 2 and 3 complete and the mechanical parts of Nos. 1 and 5.

Detached Telescopes (on tripod stands).—Three 4-inch (Simms Nos. 1 and 2 and R.O. No. 2).

Cooke 6-inch triplet Photographic Objective.

Two Hilger Chronographs.

A single-prism Spectroscope.

On loan—

Transit A, at the Cape Observatory.

Transit, with axis view, at the Science Museum, South Kensington.

Altazimuths.—A, at the Imperial College of Science and Technology, South Kensington; B, at the Cape Observatory.

Equatorials.—Simms No. 2 (6-inch), at the Imperial College of Science and Technology.

Two Heliotropes at the Science Museum, South Kensington.

Photoheliographs :—

No. 1. Object-glass at the Cape Observatory.

No. 5. Object-glass to Professor Newall, Cambridge.

Harrison's Time Machine No. 2, Whewell's Anemometer, Airy's Dip Circle, and the large Bar Magnets in use from 1841 to 1915, at the Science Museum.

9-inch Speculum flat mirror to Prof. Newall, Cambridge.

Clocks.—Dent 1916 and Dent 2013 at the Cape Observatory; Arnold 2 at the University Observatory, Oxford.

On loan to the Royal Observatory—

The Cookson Floating Zenith Telescope from the Cambridge Observatory,
for a third period of seven years from July, 1925.

A 7-inch Prism of 40° angle, from the Joint Permanent Eclipse Committee.

A Position Micrometer for measuring solar photographs, from the Solar
Physics Observatory, Cambridge.

Astrographic Micrometer from Prof. Turner.

Schuster-Smith Coil Magnetometer from the National Physical Laboratory.

A Bendorff Electrometer, two Kelvin-White Multicellular Voltmeters, and
a Flame Collector, from Dr. G. A. Carse, University of Edinburgh.

One seven-valve Amplifier and one C.W. Syntonsiser, from the Royal
Air Force.

A battery of 72 Leclanché cells, from the Director of Scientific Research
of the Admiralty.

The following instruments lent for the Solar Eclipse of June 29, 1927, are still
at the Observatory :—

16-inch Coelostat from the Royal Astronomical Society.

12-inch Coelostat from the Joint Permanent Eclipse Committee.

8-inch Coelostat from the Royal Irish Academy.

6-inch lens (45 feet focus) from J. H. Worthington, Esq.

$6\frac{1}{2}$ -inch concave mirror from Dr. G. Merton.

2 spectroscope slits from Royal Astronomical Society.

15-inch concave mirror (29 feet focus) from the Joint Permanent Eclipse
Committee.

The annual examination of the Library has been made. Twelve books are
reported missing, and cannot be accounted for at present, including five reported
last year. Three of the books missing last year have been found.

II.—Astronomical Observations :—

Transit Circle.—The Sun, Moon, major planets and fundamental stars have
been regularly observed. Satisfactory progress is being made with the observation
of stars brighter than 8.0^m between $+ 32^\circ$ and $+ 64^\circ$, begun in 1922. The

observations for this catalogue which will contain over 11,000 stars should be completed by the end of 1930.

Special efforts were made to observe the comparison stars for the opposition of Eros in 1931. The first 270 stars in Dr. Kopff's first list are satisfactorily observed. These all have right ascensions less than $9^{\text{h}} 30^{\text{m}}$, but the more important stars, required when Eros is nearest, all lie between $9^{\text{h}} 30^{\text{m}}$ and $10^{\text{h}} 35^{\text{m}}$ in R.A. Between 10^{h} and $10^{\text{h}} 35^{\text{m}}$ the average number of stars is 5 to the minute and it will be very difficult to obtain sufficient observations.

The total number of observations made during the year is as follows :—

Transits	-	-	-	10,247	Circle Observations	-	-	9,601
Collimation	-	-	-	340	Nadir point	-	-	601
Level	-	-	-	667				

The Sun was observed on 138 days and the Moon on 94 days.

Transits are reduced as far as apparent place to April 30, and Zenith Distances to March 3, and all as far as mean place to 1927, Dec. 31. The mean places for the Equinox 1925.0 have been collected on catalogue forms as far as 1925, Dec. 31.

The ledgers of Sun, Moon and planets are completed to 1927, Dec. 31.

A comparison of the observed positions of the Moon with those given in the *Nautical Almanac* gives the following results :—

Year.	No. of Obs.	R.A. s	Observed—Tabular.			
			Dec. "	Long. "	Lat. "	
1923 - - -	103	+ .473	— .73	+ 7.12	— .55	
1924 - - -	89	+ .472	— .59	+ 7.11	— .76	
1925 - - -	92	+ .454	— .78	+ 6.74	— .84	
1926 - - -	93	+ .441	— .67	+ 6.54	— .79	
1927 - - -	80	+ .419	— .85	+ 6.20	— .82	

In continuation of the discussion of the Greenwich declinations from 1851 to the present time, the stars whose declinations lie between $\pm 35^{\circ}$ and $\pm 90^{\circ}$ are under

examination. When the four close polar stars Polaris, Cephei 51, δ and λ Urs. Min. are reduced on a uniform system, the following values are found for the colatitude.

									°	'	"
1851-1865	-	-	-	-	-	-	-	-	38	31	21.86
1866-1880	-	-	-	-	-	-	-	-			21.98
1881-1895	-	-	-	-	-	-	-	-			21.81
1896-1910	-	-	-	-	-	-	-	-			21.92
1911-1925	-	-	-	-	-	-	-	-			21.88

These figures seem to negative the possibility of a secular change of the latitude of Greenwich, of appreciable amount, in 75 years.

Altazimuth.—The observations made in the prime vertical from 1923-1927 have been discussed and a catalogue based on them is being printed as a separate volume. At the conclusion of these observations the instrument was placed in the meridian and used for time determinations and observations of Eros comparison stars. The total number of observations is 1,469 in right ascension and 1,308 in declination. The number of observations of the Eros stars is 518.

The Cookson Floating Zenith Telescope.—During the year, 217 plates were taken. The measurements are completed to the end of 1927 and the results are published in the *Monthly Notices of the Royal Astronomical Society* for March 1928. A final discussion for the years 1919 to 1926 has been completed and sent to the printers. Attention may be drawn to the smallness of the variation in the last three years. The results are generally in close agreement with those from the international stations.

The value found for the constant of aberration is $20''.447$ as compared with $20''.442$ for the previous 7 years. These values correspond to values of the Solar parallax of $8''.814$ and $8''.816$.

28-inch Equatorial.—During the year 406 observations of 289 double stars were obtained. They are distributed as follows:—

85	double stars,	separation	$< 0''.5$
85	"	"	$0''.5$ to $1''.0$
65	"	"	$1''.0$ to $2''.0$
54	"	"	$> 2''.0$

A 4

Thompson Equatorial.—With the 26-inch Refractor 795 plates have been taken for stellar parallax and 568 plates have been measured. The number of complete determinations of parallax during the year is 39, making the total to date 369.

In November 1927, the parallaxes of 33 stars were published in the *Monthly Notices of the Royal Astronomical Society*.

For the greater economy of observing time an alteration has been made to the breech end of the 26-inch telescope and six plate carriers of aluminium have been purchased. These being loaded before the beginning of the watch, less time is lost in changing plates.

With the 30-inch Reflector, in pursuance of the work on relative colour temperature of stars of early type, 87 pairs have been photographed and 68 pairs have been measured. The work was interrupted for a short time during the reconstruction of the spectrograph. The lens, a 6-inch Cooke astrographic lens, was not corrected as regards colour aberration for the red. This was replaced by a mirror of 7 inches aperture and 35 inches focus, so that good definition is obtained throughout the spectrum. The photographs taken with this reflecting spectrograph are quite satisfactory.

With the 30-inch Reflector 5 photographs of the comets, Pons-Winnecke and Grigg-Skjellerup, have been obtained.

Astrographic Equatorial.—The determination of proper motions by comparison with plates taken 25 to 30 years ago has been continued. During the year 74 plates have been taken, 50 in Zone 73° , 21 in Zone 75° and 3 in Zone 77° . The reductions are all completed and copy for press prepared for the stars in Vol. 1 of the Astrographic Catalogue. With these will be published the double stars picked out by Dr. Groot and the remeasures made of these stars. A discussion and summary of his results was given by Dr. Groot in *Monthly Notices* for November 1927.

Miscellaneous Equatorial Observations.—Four disappearances and one reappearance of stars occulted by the Moon were observed. The times of 3rd and 4th contact of the Transit of Mercury on November 10 were observed with several instruments.

Heliographic Observations.—In the year ended 1928 May 10, photographs of the Sun were obtained on 245 days with either the Dallmeyer 4-inch photoheliograph

or the Thompson 9-inch. The number of photographs selected for preservation is 500, including 21 with double images of the Sun for the determination of the zeros of position angle. The zeros of position angle have also been determined regularly by visual observations.

Four photographs were taken on November 10 during the Transit of Mercury for the determination of the times of third and fourth contacts.

H.M. Astronomer at the Cape has reported that the Sun was photographed there on 338 days in the year 1927, and on 86 days in the first three months of 1928. The Director of the Kodaikanal Observatory has reported that plates were taken there on 336 days in the year 1927, and on 86 days during the first three months of 1928.

Photographs have been received from the Royal Observatory, Cape of Good Hope, to 1928 February 10. A photograph taken on July 10 has been kindly lent by the Mount Wilson Observatory for the purpose of measurement. Photographs have been received and others are in transit from the Kodaikanal Observatory to complete the series for 1927.

The measurement of the combined series has been made from 1927 January 1 to 1927 December 4.

The reductions of positions and areas of spot groups and their principal components have been completed from 1926 September 6 to 1927 October 4.

During the period covered by this Report, the solar activity on the whole has been considerable. The mean area of the Sun covered by spots was about the same in 1927 as in 1926, and shows no appreciable change during the present year. Large spots, easily visible to the naked eye, crossed the Sun's central meridian on June 8, August 14, September 14, November 10, February 21 and May 8.

Photographic prints of solar negatives for each day from 1925 July 1 to 1925 December 31 and 1926 September 11 to 1927 April 9, have been supplied to Prof. Newall.

An investigation into the occurrence of magnetic storms and sun-spots from Greenwich data is in progress. The results of an analysis of a comparison between large magnetic storms and large sun-spots have recently been communicated to the Royal Astronomical Society.

Eclipses of the Sun.—An expedition to observe the total eclipse of the Sun on June 29 was kindly accommodated on the school grounds at Giggleswick. The principal part of the programme was to photograph the Corona on a large scale with a 6-inch lens of 45-feet focus; to photograph the spectrum in the infra-red with a Littrow spectrograph; and to compare the intensity of the Ca doublet in the infra-red with the H and K lines by means of a small dispersion Littrow spectrograph. The weather previous to the eclipse was extremely bad, but the eclipse itself was observed through a break in the clouds. Small-scale photographs were also secured from an aeroplane kindly placed at the disposal of the Observatory by the *Daily Mail*. By permission of the Hydrographer of the Navy two observers from Greenwich were accommodated on board the Survey Ship H.M.S. "Fitzroy" which was engaged near the belt of totality in the North Sea. Owing to clouds no results were obtained. A full report is given in the *Monthly Notices of the Royal Astronomical Society*, Vol. 87, p. 657.

The attempt at the eclipse to compare the Calcium doublet in the infra-red with the H and K lines failed, but sufficient information was obtained to suggest the possibility of carrying out a comparison without an eclipse. The camera was reconstructed after return to Greenwich, using a longer focus mirror to produce a larger image of the Sun on the slit, and using a diffraction grating to give greater dispersion. In the autumn results were obtained which showed that the total integrated intensity of the line 8542 was somewhat greater than that of K at moderate levels. The results were published in the *Monthly Notices of the Royal Astronomical Society*, Vol. 88, p. 30, and further observations are being made at Greenwich.

At Giggleswick a colour film of the eclipse was taken by the British Polychromide Co., Ltd. A discussion of this film has been given in *Monthly Notices of the Royal Astronomical Society*, Vol. 88, p. 142. It appears that a film of an eclipse carrying an accurate time scale might give information about the height of the chromospheric layers and the exact time of mid-totality.

The principal results obtained by Mr. Davidson and Col. Stratton at the eclipse of 1926, January 14, were published in a *Memoir of the Royal Astronomical Society*. Two additional short papers on the spectroscopic results have been sent to the Royal Astronomical Society, 1927 November and 1928 May.

Permission has been given by the Admiralty for Dr. Jackson to observe the eclipse of May 9, 1929, total in the Malay Peninsula. Further observations of the deflection of light will be attempted.

III.—Magnetic Observations :—

Regular magnetic observations have been made at Abinger throughout the year. The variations of declination, horizontal and vertical force have been recorded photographically. Absolute observations of declination, of horizontal force with the *Schuster-Smith* coil magnetometer, and of dip with the Earth-Inductor, are made every week-day, while observations of horizontal force with the unifilar magnetometer have been maintained for comparison with the coil.

As regards the *Schuster-Smith* instrument the difficulty with the insulation of circuits mentioned in last year's Report has been overcome. Since 1927, February 2, it has been constituted the standard instrument. The mean difference of the base-line values as derived from this and the unifilar magnetometer is 1.6γ for the year 1927, the unifilar magnetometer giving the higher value. The average range in the base-line values from 26 observations per week with the *Schuster-Smith* instrument is 5.0γ . This is partly due to errors in reading traces.

As regards the reduction of observations, the mean hourly ordinates of all the traces have been read off to date. The reduction of absolute observations is complete to 1928 March 31, and with provisional constants to the present time.

The tabulation of results for 1927 is complete and the preparation of copy for press is well advanced.

The mean values of the magnetic elements at Abinger for the year 1927 are given below. The values for 1925 and 1926 are given for comparison.

		Decl. W.	Hor. Force.	Vert. Force.	Dip.
1925*	- -	$13^{\circ} 22'.7$	0.18597	0.42946	$66^{\circ} 35'.1$
1926	- -	$13^{\circ} 10'.4$	0.18581	0.42947	$66^{\circ} 36'.3$
1927	- -	$12^{\circ} 58'.4$	0.18575	0.42932	$66^{\circ} 36'.2$

* Mean of ten months February to November.

The weekly report of mean values of declination has been regularly sent to several offices for publication or information—a service taken over from Kew Observatory at the beginning of 1925. In response to a representative expression of opinion from mining surveyors that hourly mean values would be more useful to them than two-hourly means, the table was expanded to give hourly mean values of declination at Abinger, commencing on May 29, 1927.

Arrangements have been made recently with the Director of the Meteorological Office for the Abinger and Eskdalemuir values to be given in the same form for the purposes of the weekly report.

In connection with the Magnetic Survey of the British Isles by the Ordnance Survey Department, Mr. H. L. P. Jolly has kept in touch with the Abinger station during the surveying season. Values of the magnetic elements at Abinger at the times of field observations made during 1927 have been supplied to the Director of the Ordnance Survey, Southampton.

A portable coil-magnetometer of novel character, designed for field work by Dr. F. E. Smith, Director of Scientific Research, Admiralty, has been under test at Abinger prior to being used by Mr. Jolly in his work.

IV.—Meteorological Observations :—

The registration of atmospheric pressure, temperature of the air and of evaporation, the direction, pressure and velocity of the wind, the amount of rainfall, sunshine and cloudiness at night has been continuously maintained.

Estimates of visibility are included in the meteorological observations made by eye at fixed hours.

The registration of the electric potential gradient of the atmosphere with a radium collector and a Kelvin-White quadrant electrometer has also been maintained.

The following details of the weather refer to the period of twelve months ended 1928 April 30 :—

The mean temperature was $49^{\circ}\cdot7$, or $0^{\circ}\cdot1$ above the average of the 75 years 1841–1915. The highest temperature in the shade was $84^{\circ}\cdot9$ on June 16, and the temperature exceeded 80° on three days only. The lowest temperature was $18^{\circ}\cdot5$ on December 19. Temperatures of freezing point or below were recorded on forty days, one of which was in May. The mean daily horizontal movement of the air was 292 miles, which is 8 miles above the average for 50 years 1867–1916. The greatest daily movement was 1,003 miles, recorded on February 11; the least, 56 miles, on October 4. The greatest velocity in one hour, 57 miles, was recorded on February 11. The greatest pressure reached was 27·8 lbs. to the square foot, on January 6. The duration of bright sunshine recorded was 1,246 hours out of a possible 4,473, or 27·4 per cent. There were 82 entirely sunless days in the period. The total rainfall was 27·78 inches, that is, 3·54 inches more than the average for

75 years 1841–1915, and measurable rain fell on 182 days. The wettest month was September, with 4.07 inches. The driest month, reckoned by the daily average, was May, with 1.21 inches, although the total rainfall in February was actually .05 inch less than this.

V.—Printing and Distribution of Greenwich Publications :—

The volume for 1925 and its separate parts have been distributed and the printing of the volume for 1926 is complete. A small volume on Determination of Effective Wave-Lengths has also been distributed. The printing of a volume of Declinations of Stars from observations of Transits in the Prime Vertical with the Altazimuth, in the years 1923–26, is completed, and the MSS. of another small volume, Variation of Latitude for the years 1919–27, has been sent to the printers.

VI.—Chronometers :—

The number of chronometers and watches belonging to the Admiralty now at the Observatory is 3,067. Of this total, 230 chronometers, 266 chronometer watches, 349 hack watches and 44 pocket watches are being rated. The remainder, consisting of 353 chronometers, 1,056 chronometer watches, 121 hack watches and 644 pocket watches are kept in storage.

In addition to Admiralty chronometers there are 38 chronometers and 15 watches deposited at the Observatory for various reasons.

During the year ending 1928, April 30, a total of 1,716 chronometers and watches have been received and 1,746 issued. The number sent for repair was 1,052, viz., 987 for the Admiralty, 1 for the Colonial Office, 57 for the Indian, 2 for the Canadian, and 5 for the Egyptian Governments.

VII.—Time Service :—

The longitude observations made in October and November 1926, indicated a systematic difference of $^s.09$ between the transit circle and the small reversible “transit instrument B.” This difference is fairly steadily maintained but as a reversible instrument is more suited for time-determinations, the practice has been started of obtaining clock errors at intervals of about a week with the small reversible instrument and basing the time-service upon these observations. The number of nights in the year under report on which observations were made is 44.

The Clock Shortt No. 3 has been used as Standard Sidereal Clock throughout the year and Shortt No. 11 has been compared regularly with it. Both clocks have

maintained very steady rates; the air leakage into the clock cases has been negligible.

A discussion of the performance of the two clocks has been published in *Monthly Notices of the Royal Astronomical Society*, Vol. 88, No. 5. It has been shown that the progressive change found in the clock rates can be accounted for by an increase in the length of the pendulum rod which is made of invar. The progressive increase of $0^s.011$ per day per month in the rate corresponds to a lengthening of the pendulum rod at the rate of one micron (0.001 mm.) in 118 days. The clocks also show a temperature inequality of $0^s.003$ per day for 1° F. change, or approximately 1 second per year for one degree (Fahr.) change of temperature.

The daily time signals to the General Post Office and the British Broadcasting Corporation have been transmitted regularly. The service of Rhythmic Time Signals transmitted through the Post Office Wireless station at Rugby, mentioned in last year's Report, was commenced on 1927, December 19, signals being sent out daily at 10^h and 18^h . The signal apparatus is controlled by a Free Pendulum clock, Shortt No. 16, which also controls the mean time clocks used for the Post Office and Broadcast signals.

The corrections to the transmitted times of the rhythmic signals for adjustment to the final time determinations are published and distributed periodically by the Hydrographer of the Navy in "*Notices to Mariners*."

The Time Ball has been dropped accurately throughout the year, with two exceptions, viz.: May 29, when a false drop was made before the signal, and on February 11 when the Ball was not raised on account of high wind.

The performance of the time balls at the Admiralty Signal stations and also the Westminster Clock is shown by the following table of the errors of the return signals.

Error of Return Signal.	Portsmouth.	Portland.	Devonport.	Westminster.
Not greater than $0^s.2$ - - - -	254	207	267	103
$0^s.3$ to $0^s.5$ - - - -	4	12	5	88
$0^s.6$ to $1^s.0$ - - - -	0	0	0	63
Greater than $1^s.0$ - - - -	0	0	0	22

The clocks at the Admiralty stations are corrected daily by the 10^h signal, but the Westminster Clock is not so corrected.

Wireless time signals have been received regularly from the Eiffel Tower, Nauen, Bordeaux and Annapolis. They are registered automatically on a syphon recorder operated by a relay, controlled by an amplifying system. A four valve receiving set by the Marconi Co., Ltd., type R.P. 11, designed for continuous wave working from 15,000 to 22,000 metres, was purchased in 1927, July. The set is arranged to operate from a small frame aerial with a phasing unit connected to an open aerial in conjunction. By this means a high degree of selectivity is obtained.

The monthly means of the differences from Greenwich shewn by the various time signals, using the final clock errors derived from observations made with the small reversible transit instrument "B" are given in the following table. The Annapolis signals have been corrected for lag of land line to Washington and 0^s.02 for time of travel.

1927.	Paris 9 $\frac{1}{2}$ ^{hr} Rhythmic.	Nauen 12 ^{hr} Rhythmic.	Annapolis 17 ^{hr} .	Bordeaux 20 ^{hr} Rhythmic.
	S.	S.	S.	S.
January - - - -	+ .044	- .023	+ .022	+ .043
February - - - -	+ .051	- .031	+ .009	+ .028
March - - - - -	+ .017	- .096	- .005	+ .012
April - - - - -	+ .048	- .051	+ .021	+ .021
May - - - - -	+ .102	+ .031	+ .086	+ .087
June - - - - -	+ .014	- .114	- .010	+ .022
July - - - - -	+ .081	- .055	+ .068	+ .085
August - - - - -	+ .009	- .037	+ .054	+ .014
September - - - -	+ .052	- .039	+ .008	+ .056
October - - - - -	+ .068	- .074	+ .008	+ .073
November - - - - -	*	- .058	- .024	+ .034
December - - - - -	*	- .064	- .071	+ .023
Mean - - - - -	—	- .050	+ .010	+ .042
Number of comparisons - -	226	278	264	262

The sign + means late on Greenwich. The reference point for all comparisons is the commencement of the signals.

* Final corrections not yet available.

VIII.—Personal Establishment :—

The permanent staff at the present time is constituted as follows :—

Chief Assistants.—Mr. Greaves, Dr. Jackson.

Assistants.—Mr. Bowyer, Mr. Davidson, Mr. Furner, Mr. Witchell.

Junior Assistants (Higher Grade).—Mr. Acton, Mr. Cullen, Mr. Melotte, Mr. Stevens.

Junior Assistants.—Mr. Barton, Mr. Chamberlain, Mr. Finch, Mr. Jeffries, Mr. Martin, Mr. Newton, Mr. Rickett, Mr. Symms, Mr. Wells and one vacancy.

Clerical Assistant.—Mr. Edney.

20 Computers, including 3 ladies, are employed at the Observatory.

The present arrangement of the staff under the general superintendence of the Chief Assistants is as follows :—

Branch.	Established Staff.	Unestablished Staff.
<i>Transit Circle, Altazimuth and Zenith Telescope.</i>	Mr. Furner, Mr. Cullen, Mr. Acton, Mr. Symms.	Mr. Fellows, Mr. Davies, Mr. Rood, Mr. Ware, Mr. Bennett, Mr. Slator, Mr. Blackwell, Mr. Whybrow.
<i>Time Signals and Chronometers</i> -	Mr. Bowyer, Mr. Rickett -	Mr. McKenzie, Mr. Brown, Mr. Harris.
<i>Thompson Equatorial</i> - - -	Mr. Davidson, Mr. Martin -	Miss Jeffries, Mr. Rickerby.
<i>28-inch Equatorial</i> - - -	Mr. Furner - - -	
<i>Astrographic Equatorial</i> - -	Mr. Melotte, Mr. Jeffries - -	Mr. Smith.
<i>Photoheliograph</i> - - - -	Mr. Newton, Mr. Barton - -	Miss Jackson, Mr. Judd.
<i>Magnetic and Meteorological</i> -	Mr. Witchell, Mr. Stevens, Mr. Wells, Mr. Finch.	Miss Clack, Mr. Oliver, Mr. Reece.
<i>Secretariat and Library</i> - -	Mr. Edney, Mr. Chamberlain -	Mr. Daily.

The staff of workmen now employed consists of a foreman of works, two joiners, a mechanic, a boy assistant mechanic, a gate porter, two messengers, a night watchman, a gardener, three labourers and a charwoman. There is also a mechanic at Abinger who has charge of the engines and acts as caretaker.

IX.—General Remarks :—

The Observatory was honoured by a visit of His Majesty the King of Afghanistan on March 22.

Mr. Horrocks, who had been at Greenwich from January 1927, took part in the general work of the Observatory till his departure in August to take up his appointment as Chief Assistant at the Cape Observatory.

During September, Professor Kerr Grant made some experiments preparatory to an absolute determination of the value of gravity.

In November, Capt. McCaw and Mr. Jolly swung the half-seconds pendulums of the Cambridge School of Geodesy in the same position as Sir G. Lenox-Conyngham and Mr. Putnam had used in previous observations, and also on a new site in the Magnetic Pavilion. The results of the two sites agreed closely and gave the same difference from Kew as had been previously found.

Dr. Kreiken was here from April 12 to April 27 studying the methods in making parallax observations previous to his taking up this kind of work at Lembang.

The Astronomer Royal attended the International Geophysical Union at Prague in September, and took part in the discussions on longitude observations and on a more complete uniformity in presenting the results of Magnetic Observations by different observatories.

The total eclipse of the Sun on June 29, on account of the rarity of this phenomenon in England, aroused much public interest. Although the weather was generally unfavourable, the expedition from the Observatory to Giggleswick was fortunate and obtained a beautiful and instructive picture of the Corona.

The distribution of Greenwich Time from the Wireless Station at Rugby should be of service to Astronomers, Surveyors and Navigators in all parts of the world. It may be of interest to note that the possible use of "galvanism" for the distribution of time from Greenwich was referred to by Airy in the Report to the Board of Visitors for 1849, and in 1852 he states that he "has entered into communication with the authorities of the South Eastern Railway (whose line of galvanic communication will shortly pass within nine furlongs of the Observatory)." On August 28, 1852, a time-ball was dropped in the Strand by signals transmitted through an electric clock at Greenwich made by Shepherd. Shortly afterwards a clock at London Bridge Railway Station was made to distribute hourly time

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signals to the Electric Telegraph Company's system and to different branches of the South Eastern Railway. When the telegraphs were taken over by the General Post Office in 1870, a complete system for telegraphic distribution of time-signals from Greenwich was gradually developed. The transmission of wireless time-signals from Greenwich by the British Broadcasting Company was commenced in January, 1924, but has only a limited range. The present service brings Great Britain into line with France, Germany and the United States. The times of transmission have been chosen after consideration of the hours at which signals are sent from other stations, and after consultation with the Hydrographer of the Navy and the Secretary of the Royal Geographical Society. The installation of these signals, as of the "Shortt" clocks, owes much to the enthusiasm, care and patience of Mr. Bowyer.

Special attention may be drawn to the progress made this year in the determination of the colour-temperatures of stars. The substitution of a mirror for a lens has resulted in getting the red end of the spectrum into focus, so that a greater length can be used. The micro-photometer has been modified so that narrower lengths of the spectrum can be measured and absorption lines avoided.

In conclusion, in a year particularly unfavourable in the weather, the observers in all departments have worked with enthusiasm to maintain a good output.

Royal Observatory,
Greenwich.

F. W. DYSON.

1928 May 21.