

REPORT
OF THE
ASTRONOMER ROYAL
TO THE
BOARD OF VISITORS
OF THE
ROYAL OBSERVATORY, GREENWICH.

Read at the Annual Visitation of the Royal Observatory, 1929 June 1.

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REPORT OF THE ASTRONOMER ROYAL

TO THE

BOARD OF VISITORS

OF THE

ROYAL OBSERVATORY, GREENWICH.

Read at the Annual Visitation of the Royal Observatory, 1929 June 1.

The Report here presented refers to the year from 1928 May 11 to 1929 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 domes of the 28-inch and Sheepshanks Equatorials, the Altazimuth, Transit Pavilion and Photoheliograph was completed on July 14.

The weather vane on the Ball Mast was not moving freely and was dismantled and repaired in September. At the same time new wooden cross-trees were fitted to the top of the mast.

A small wooden building adjoining the Ball Turret is being erected on the roof of the Octagon Room to house a carbon arc and accessories required for observations of stellar temperatures being made with the 30-inch reflector. A new motor generator to supply direct current to this arc was received on March 27 and is being installed in the same room as the motor generator already in use. It will supply 20 amperes at 110 volts.

Provision of a motor to turn the 28-inch dome has been made in the Estimates.

At Abinger, lightning conductors were placed on the two Magnet Houses in November. The ignition of the engines has required some attention and repairs to the magnetos are being carried out. The exteriors of the buildings were painted in July.

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The principal movable instruments are thus distributed :—

At Greenwich—

Transits B, C and D.—Transit B is fitted with an impersonal Micrometer.
(Transit E has been sold to the Egyptian Government.)

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 Stratton, 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. Stratton, Cambridge.

4-inch negative enlarging lens to H. G. Tomkins, Esq.

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.

Schuster-Smith Coil Magnetometer for measurement of Horizontal Intensity, from the National Physical Laboratory.

A Coil Magnetometer, designed by Dr. D. W. Dye, F.R.S., for measurement of Vertical Intensity, from the National Physical Laboratory.

The following instruments were borrowed for observation of the Solar Eclipse of May 9 and are on loan to the Observatory :—

16-inch Coelostat from the Royal Astronomical Society.

8-inch Coelostat from the Royal Irish Academy.

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

2 spectroscopes slits from Royal Astronomical Society.

15-inch Pyrex mirror from J. Evershed, Esq.

The annual examination of the Library has been made. Thirteen books are reported missing, and cannot be accounted for at present, including nine 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. The planet Vesta has been regularly observed in view of the possibility of its use in checking the position of the Equator.

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

Transits	8,987	Circle Observations ..	8,937
Collimation	285	Nadir point	650
Level	709		

The observation of the stars for comparison with the planet Eros in the opposition of 1930–1931 has been continued. The first list of stars published by Dr. Kopff have been satisfactorily observed, but cloudy weather has interfered a good deal with the second list. Of the 496 stars which were included in the programme of observations, 365 have

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been observed five times, 20 four times, 29 three times, 33 twice, 23 once, and for 26 stars no observations have been obtained.

The Sun was observed on 148 days and the Moon on 109 days.

Transits are reduced as far as apparent place to April 28 and Zenith Distances to April 5. Mean places for the Equinox 1925·0 have been determined as far as 1928 December 31 and have been collected on Catalogue forms up to 1927 August 4. The planetary ledgers are completed to 1928 December 31.

The observations of Eros stars are being collected and reduced to epoch 1930·0 for transmission to Dr. Kopff.

On suitable evenings, and at times when the Catalogue stars are well observed, observations by reflection and directly of Zenith Distances have been made by Mr. Cullen and Mr. Acton. Altogether 160 observations have been made on 15 nights. The results give a satisfactory confirmation of the Nadir point as obtained by direct reflection from mercury.

Observations of the Moon give the following corrections to Brown's tables:—

Longitude.				Latitude.		No. of observations.	
		Limb.	Mösting A.	Limb.	Mösting A.	Limb.	Mösting A.
		"	"	"	"		
1923	..	.. + 6·99	+ 7·47	— 0·56	— 0·63	101	60
1924	..	.. + 7·21	+ 7·14	— 0·82	— 0·59	87	54
1925	..	.. + 6·61	+ 6·71	— 0·87	— 0·75	90	52
1926	..	.. + 6·40	+ 6·55	— 0·68	— 0·92	93	66
1927	..	.. + 6·20	+ 6·24	— 0·70	— 0·91	80	43
1928	..	.. + 5·51	+ 5·83	— 0·93	— 0·68	97	60

Results of observations of the Sun and four outer planets since the introduction of new tables in 1901 were given in the *Monthly Notices* for January, 1929. Discussions have also been published of the observations of Sun and Moon from 1751–1927 as indicating variability in the Earth's rotation and a small secular acceleration $+ 0''\cdot78 T^2$ of the Sun's mean longitude.

Altazimuth.—The instrument has only been in use for a short time during the year to supplement the observations of the Eros comparison stars made with the Transit Circle. During the year 446 transits and 422 zenith distances were observed. Added to those previously obtained, observations have been made of 434 stars. The results are being collected in ledger form reduced to the epoch 1930·0.

Cookson Zenith Telescope.—During the year 246 plates were taken. The measurements are completed to the end of 1928 and the results 'published' in the *Monthly Notices* for March 1929. The total range of the variation in the last four years is very small, being only $0''.15$. The discussion of the observations during the period 1919 to 1926 was published in November.

28-inch Equatorial.—During the year 385 observations of 282 double stars were obtained. These consist of :—

44	double stars, with separation	$< 0''.5$
62	„ „ „	$0''.5$ to $1''.0$
82	„ „ „	$1''.0$ to $2''.0$
197	„ „ „	$> 2''.0$

A working programme of about 2,000 stars discovered by Dr. Aitken has been prepared. These stars are being observed as the stars in the present programme are finished.

For the water-drive of the Equatorial, an electric drive of the Gerrish type is being substituted. This consists of a direct drive from an electric motor controlled by a pendulum. The construction is being carried out in the workshop. In the preparation of the plans we are indebted to Mr. F. J. Hargreaves for much assistance.

Thompson Equatorial.—With the 26-inch Refractor 1,273 plates have been taken for stellar parallax and 760 plates have been measured. The number of complete determinations of parallax during the year is 31, making the total to date 400.

As mentioned in the last Report, an alteration has been made to the breech end of the 26-inch telescope and six aluminium plate-holders provided so that the time available at the telescope might be used with greater economy. The expectation that the number of plates taken would be increased by about 50 per cent. has been borne out. The practice has now been adopted of taking two fields on one plate. This reduces the cost in the plates used and the time spent in subsequent manipulation in the developing room.

In November 1928 the parallaxes of 30 stars were published in the *Monthly Notices*.

With the 30-inch Reflector the work on colour temperatures of stars has been continued. Utilising the material already obtained, a list of 24 early type stars (B_2 to A_5) has been selected for the purpose of obtaining a set of colour standards. Observations of these stars, taken in pairs at equal altitudes, are being made with the object of determining their relative colour temperatures on a common basis. When this scheme of work has been completed these stars will be available as standard stars with which any

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other star may be compared, the standard stars having been so chosen that it will always be possible and convenient to compare any other star with one of them at an equal altitude. In this way it is proposed to determine the relative colours of the brighter stars of all types. The colour scale thus determined will be an absolute one—that is, it will be independent of the special characteristics of the photographic plate used or of the optical train.

The temperatures thus obtained will be relative to the mean system of standard stars. To complete the work it will be necessary to determine the absolute temperature of the mean system, and this will be done by comparison with a standard terrestrial source of known temperature. It is proposed to use the positive crater of the carbon arc. An arc lamp will be mounted on the roof of the Octagon Room 600 feet away and photographed on the same plate and with the same optical train as the stars, the focus of the telescope being adjusted by a movement of the convex mirror of the Cassegrain telescope.

Some previous attempts to compare stars with the carbon arc (see *M.N.*, Nov. 1925) have already been made, but, amongst other difficulties, it was found that the motor generator used for charging storage batteries was insufficient adequately to maintain the arc. A new motor generator is therefore being installed. The current is carried on overhead wires to the lamp, which is housed in a small hut built for its protection on the north-east corner of the roof of the Octagon Room.

During the year 180 comparisons of pairs of standard stars were obtained. To this must be added 115 comparisons secured previously. This part of the work should be completed by September.

The principal difficulty in comparing a star with a terrestrial source is due to atmospheric absorption, which may be assumed to vary with the secant of the zenith distance. It is more than probable that this constant varies from night to night, so that it must be determined by observing high and low standard stars whenever a comparison is made, hence the necessity for the completion of the standard system.

In addition, 144 comparisons of 32 stars of types B_0 to G_0 with one or more of the standard stars have been obtained, which, with 124 observations on 18 stars obtained previously, makes 268 observations on 40 stars.

The measurement and reduction of the photographs is practically up to date.

Notes have been published on stars of types B_0 to B_2 of abnormally low colour temperature in the *Monthly Notices* 1928 June and November.

Astrographic Equatorial.—The determination of proper motions by comparison with plates taken 25 to 30 years ago has been continued. During the year 63 plates have been taken, 28 in Zone 75° , 20 in Zone 77° , and 15 in Zone 79° . In addition, 23 plates of the Eclipse Field, 7 of the Pleiades, 3 of Eros, and 13 for adjustment of the telescope. Forty-two plates in Zone 73° have been measured and reductions are completed to R.A. 17h. 0m.

The results of the measures from 64° to 72° Dec. are now in the press. This Volume is a review of Vol. I of the Greenwich Astrographic Catalogue, and contains proper motions of all stars down to the limits of magnitude of the *Astronomische Gesellschaft*, the proper motions of fainter stars which are greater than $3''$ or $4''$ a century, lists of double stars and of stars with common proper motions.

Miscellaneous Equatorial Observations.—Two occultations of stars by the Moon were observed in the year.

Heliographic Observations.—Photographs of the Sun were obtained on 266 days with either the Dallmeyer 4-inch photoheliograph or the Thompson 9-inch. The number of photographs selected for preservation is 534, including 34 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.

H.M. Astronomer at the Cape has reported that the Sun was photographed there on 340 days in the year 1928, and on 90 days in the first three months of 1929. The Director of the Kodaikanal Observatory has reported that plates were taken there on 333 days in the year 1928, and on 88 days during the first three months of 1929.

Photographs have been received from the Royal Observatory, Cape of Good Hope, to 1929 February 5. Photographs have been received and others are in transit from the Kodaikanal Observatory to complete the series for 1928.

The measurement of the combined series has been made from 1927 December 5 to 1928 October 24.

The reductions of positions and areas of spot groups and their principal components have been completed from 1927 October 5 to 1928 July 8.

Solar activity has remained considerable, although there are now signs of a progressive decrease. The maximum of the current cycle has not been sharply defined, but has extended from 1926 to 1928 with some indication of a double peak. Large spots

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crossed the Sun's central meridian on July 12, 17, 31 ; September 12, 24, 27 ; December 5, January 17 and March 11.

Photographic prints of solar negatives for each day from 1927 April 10 to 1928 March 31 have been supplied to the Solar Physics Observatory, Cambridge.

Daily spot-numbers, both for the whole disc and for a central zone of the sun, based on Wolf's method of counting, are being supplied quarterly to Zürich for incorporation in the *Bulletin for Character Figures of Solar Phenomena* published under the auspices of the I.A.U.

An investigation into the occurrence of magnetic storms and sun-spots from Greenwich data has been continued. The results have been given in two papers communicated to the Royal Astronomical Society.

Eclipse of the Sun.—In co-operation with the Joint Permanent Eclipse Committee, arrangements were made for Dr. Jackson to observe the Eclipse at Alor Star in Kedah and Mr. Melotte at Pattani in Siam. They were to attempt the measurement of the deflection of light, while their colleagues from Cambridge were engaged on spectrophotometric observations. Much time and effort was given to preparation. A new instrument with coelostat was got into order by Dr. Jackson. The Astrographic telescope was dismounted and set up on a base suitable for the latitude of Pattani. Unfortunately, on May 9, the day of the Eclipse, the Sun was completely covered by cloud at one station and only seen through high cloud at the other. No observation of the deflection of light was possible. The transparency seems to have been similar to that at Giggleswick in 1927. Large prominencies and coronal arches are seen on the photographs.

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.

A coil magnetometer for the direct measurement of vertical force, designed by Dr. D. W. Dye, has been temporarily loaned by the Director of the National Physical Laboratory for use at Abinger. It was erected on the south-east pier of the observing pavilion on 1928 August 9, the unifilar magnetometer being removed to the testing hut to make room.

In connection with the installation the Broca galvanometer and auxiliary apparatus formerly employed at Greenwich with the Dip Inductor was transferred to Abinger for use in measuring the current. The magnetometer was brought into routine working on August 22, and a large number of observations of vertical force has been made. The number averages 40 per week, and the mean weekly range in base-line values determined from the observations is 12.9γ . The observations, however, give results consistently smaller than the results obtained from the two Dip Inductors. The difference amounts in the mean to 31.2γ and, so far, has not been satisfactorily accounted for. An investigation of possible causes is being made.

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 1929 March 31, and with provisional constants to the present time.

The tabulation of results for 1928 is complete and the preparation of copy for press is well advanced.

The mean values of the magnetic elements at Abinger for the year 1928 are given below. The values for 1925 to 1927 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	$66^{\circ} 36'.2$
1928 ..	..	$12^{\circ} 47'.0$	0.18564	0.42941	$66^{\circ} 37'.3$

* Mean of ten months February to November.

The weekly report of mean hourly 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 and now maintained in conjunction with Eskdalemuir Observatory.

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 1928 have been supplied to the Director of the Ordnance Survey, Southampton.

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

A preliminary astronomical determination of the latitude and longitude of the Abinger observing station was carried out during the winter. The resulting longitude, from comparisons on 14 nights, was $0^{\text{h}} 1^{\text{m}} 32^{\text{s}}.83$ (*i.e.* $0^{\circ} 23' 12''.4$) West, and the resulting latitude from 46 zenith distances was $51^{\circ} 11' 4''.8$ North. The instrument employed was Airy's Reflex Zenith Telescope.

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—unsatisfactory for some time—was interrupted for six months from the beginning of October 1928, pending a thorough examination of the instrument. It was found that the battery of Leclanché cells had become very inefficient through deterioration of material.

The replacement of this battery by a battery of dry cells, and the substitution of a bi-filar suspension of 0.03 mm. tungsten wire with 1 mm. separation, in place of the single copper wire previously in use, has resulted in more sensitive recording. The scale-value is now under control by weights placed on the needle shaft; and the position for zero potential is very stable. Two electrostatic voltmeters of the Ayrton-Mather pattern have been purchased for the purpose of standardising the records by eye-readings of potential.

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

The mean temperature was $48^{\circ}.7$, or $0^{\circ}.8$ below the average of the 75 years 1841–1915. The highest temperature in the shade was $92^{\circ}.0$ on July 22, and the temperature exceeded 80° on eighteen days, including two days on which it also exceeded 90° . The lowest temperature was $12^{\circ}.0$ on February 15. Temperatures of freezing point or below were recorded on seventy-one days. The mean daily horizontal movement of the air was 268 miles, which is 16 miles below the average for 50 years 1867–1916. The greatest daily movement was 821 miles, recorded on November 25; the least, 55 miles, on March 3. The greatest velocity in one hour, 58 miles, was recorded on November 16. The greatest pressure reached was 47.0 lbs. to the square foot, on November 16. The

duration of bright sunshine recorded was 1,633 hours out of a possible 4,438,* or 36·8 per cent. There were 74 entirely sunless days in the period. The total rainfall was 20·46 inches, that is, 3·78 inches less than the average for 75 years 1841–1915, and measurable rain fell on 143 days. The wettest month was October, with 3·45 inches. The driest month was March, with 0·038 inches, a low total without parallel in any month since Greenwich records began.

V.—Printing and Distribution of Greenwich Publications :—

The volume for 1926 and its separate parts have been distributed and the printing of the volume for 1927 is complete. A volume of Declinations of Stars from observations of Transits in the Prime Vertical with the Altazimuth, in the years 1923–26, and another small volume, Variation of Latitude for the years 1919–27, have also been distributed. Vol. V of the Astrographic Catalogue is being printed.

VI.—Chronometers :—

The number of chronometers and watches belonging to the Admiralty now at the Observatory is 3,128. Of this total, 195 chronometers, 241 chronometer watches, 317 hack watches and 30 pocket watches are being rated. The remainder, consisting of 384 chronometers, 1,074 chronometer watches, 233 hack watches and 650 pocket watches are kept in storage.

In addition to Admiralty chronometers there are 40 chronometers and 16 watches deposited at the Observatory for various reasons.

During the year ending 1929 April 30, a total of 1,854 chronometers and watches have been received and 1,790 issued. The number sent for repair was 955, viz., 898 for the Admiralty, 49 for the Indian, 3 for the South African, and 4 for the New Zealand Governments, and 1 for the Royal Air Force.

VII.—Time Service :—

The Time determinations have been made throughout the year by means of the reversible transit instrument “B” fitted with impersonal micrometer. When possible, observations are made at intervals of not more than 5 days. In the year, 1928 May 11—1929 May 10, observations have been made on 71 nights.

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. The temperature in the clock cellar is now maintained at 62°·8 F.

* Registration was omitted on two days.

An extension of the discussion of the performance of the two clocks has been published in *Monthly Notices*, Vol. 89, No. 3. The progressive increase of losing rate of the clocks shows no diminution. It seems possible that this effect may be due in part to the pendulum bobs, which are made of type-metal, and it is proposed to substitute a bob of invar on one of the clocks.

The service of Rhythmic Time Signals at 10^h and 18^h transmitted through the Post Office Wireless station at Rugby, and also the daily time signals to the General Post Office and the British Broadcasting Corporation, have been transmitted regularly. The Free Pendulum Clock, Shortt No. 16, controls the mean time clocks used for the Post Office and Broadcast signals, in addition to the Rhythmic signal transmitter.

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 failed to drop accurately on one occasion, November 11, when the ball was not released at 13^h. On November 25 the Ball was not raised on account of high wind.

From July 9–July 11 and November 12–14 the Time Ball was not raised on account of repairs to the lifting gear being in progress. From August 24–September 21 the Ball was out of action during progress of repairs to the wind vane and crosstrees at the top of the Mast.

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	211	178	281	109
0 ^s .3 to 0 ^s .5	7	5	2	86
0 ^s .6 to 1 ^s .0	0	0	0	87
Greater than 1 ^s .0	0	0	0	8

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 are received regularly from the Eiffel Tower, Nauen, Bordeaux and Annapolis. These are registered automatically, and the corrections found for the

Nauen, Bordeaux and Annapolis signals are published monthly for distribution in "*Notices to Mariners*," together with the corrections to the Rugby signals.

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.

1928.	Paris 9 $\frac{1}{2}$ ^h Rhythmic.	Nauen 12 ^h Rhythmic.	Annapolis 17 ^h .	Bordeaux 20 ^h Rhythmic.
	s.	s.	s.	s.
January	·000	—·059	—·072	—·020
February	+·038	—·064	—·037	+·032
March	+·064	—·033	+·011	+·060
April	+·036	—·013	—·045	+·035
May	+·088	+·018	+·011	+·092
June	+·090	+·035	+·005	+·086
July	+·011	—·050	—·016	+·019
August	+·030	+·030	+·022	+·040
September	—·011	—·054	—·039	—·001
October	+·013	—·060	—·030	+·019
November	*	—·069	—·038	*
December	*	—·037	—·028	*
Mean	(+·036)	—·030	—·021	(+·036)
Number of comparisons ...	232	292	339	280

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. Rickerby, Mr. Rickett, Mr. Symms and Mr. Wells.

Clerical Assistant.—Mr. Edney.

19 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. Ware, Mr. Bennett, Mr. Slator, Mr. Blackwell, Mr. Malyon, Mr. Diston, Mr. Larkin.
<i>Time Signals and Chronometers</i> ...	Mr. Bowyer, Mr. Rickett ...	Mr. McKenzie, Mr. Harris, Mr. Shortland.
<i>Thompson Equatorial</i> ...	Mr. Davidson, Mr. Martin ...	Miss Jeffries, Mr. Whybrow.
<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>Small Transit</i> ...	Mr. Finch ...	
<i>Magnetic and Meteorological</i> ...	Mr. Witchell, Mr. Stevens, Mr. Wells, Mr. Rickerby.	Miss Clack, Mr. Oliver, Mr. Reece.
<i>Secretariat and Library</i> ...	Mr. Edney, Mr. Chamberlain ...	Mr. Dennis.

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 from the Regent of Kedah on June 14.

Largely owing to the meeting of the International Astronomical Union at Leiden we have had the pleasure of visits from a number of foreign astronomers. Such visits are always valuable to members of the staff, furnishing, as they do, opportunities of discussing work and interchanging ideas.

Mr. A. H. Miller, of Ottawa, made a valuable series of gravity determinations in July and August, on the site in the Magnet House which Capt. McCaw and Mr. Jolly had used in the previous November. Provisional results of his observations at Greenwich and Potsdam, and based on the absolute value 981.275 at Potsdam, give for Greenwich $g = 981.188$ and for Ottawa $g = 980.620$.

TO THE BOARD OF VISITORS, 1929 JUNE 1.

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Mr. Plakidis, of the Athens Observatory, was at Greenwich from July 30 to November 3, and studied the work of all departments of the Observatory. Dr. Öhman, of the Upsala Observatory, was at Greenwich from June 19 to July 2, studying the method of parallax observation and reduction.

The Astronomer Royal, Dr. Jackson and Mr. Davidson attended the meetings of the International Astronomical Union at Leiden. The Astronomer Royal attended a meeting of the International Research Council at Brussels. He and Dr. Jackson also attended the Meetings of the Astronomische Gesellschaft at Heidelberg.

The fortune of weather has been against us at the Eclipse, but this does not diminish our gratitude for the help which has been kindly given. His Majesty the King of Siam took a personal interest in the observations at Pattani, and His Government made all necessary arrangements for the Scientific and personal needs of the observers. The observers at Alor Star received the same kind consideration from His Highness the Regent of Kedah and his Government. Both British Expeditions are much indebted to Col. Waley Cohen for his assistance in selection of sites, involving a visit to Siam and Kedah last year, and for valuable help in many ways.

It is a great pleasure to mention to the Board the skill and enthusiasm of the staff of workmen of the Observatory. The construction of the new driving gear of the 28-inch Equatorial was carried out entirely in the Observatory workshop. Preparations for the Eclipse made a special demand on the workmen during the year. In addition to many smaller items, apparatus was constructed for moving the long telescope, used with a coelostat, readily from the Eclipse field to a comparison field five degrees away. The taking down and re-erection on a base, suitable for the latitude of Pattani, of the Astrographic Telescope was also work which required care and skill. All the instruments were erected at Greenwich before being packed. Suitable wooden and canvas huts were constructed which the observers could readily put together. Altogether 10 tons of luggage left the Observatory, arrived safely, and was erected without difficulty. This was largely due to the efforts of the staff of workmen of the Observatory, and deserves grateful recognition.

F. W. DYSON.

Royal Observatory,
Greenwich.

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