REPORT

OF THE

ASTRONOMER ROYAL

TO THE

BOARD OF VISITORS

OF THE

ROYAL OBSERVATORY, GREENWICH.

Read at the Annual Visitation of the Royal Observatory, 1919 *June* 14.

GREENWICH OBSERVATIONS, 1918.

THE BOARD OF VISITORS.

The President of the Royal Society	Sir J. J. Thomson.
The President of the Royal Astronomical Society	Prof. A. Fowler.
Nominated as Fellows of the Royal Society	Prof. A. Fowler. Mr. J. H. Jeans. Prof. Sir J. Larmor. Sir Napier Shaw. Lord Rayleigh. Prof. A. Schuster.
Nominated as Fellows of the Royal Astronomical Society.	Capt. Sir W. de W. Abney. Sir W. H. M. Christie. Dr. J. W. L. Glaisher. Brig.-General E. H. Hills. Mr. E. B. Knobel. Prof. H. F. Newall.
Savilian Professor of Astronomy at Oxford	Prof. H. H. Turner.
Plumian Professor of Astronomy at Cambridge	Prof. A. S. Eddington.
Hydrographer of the Navy	Rear-Admiral John F. Parry.
Secretary	Mr. W. D. Barber.

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Read at the Annual Visitation of the Royal Observatory, 1919 *June* 14.

The Report here presented refers to the year from 1918 May 11 to 1919 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 old part of the Observatory was completed on 1918 August 31. This included the Astrographic, Sheepshanks, Transit Pavilion and Altazimuth domes.

The roof of the Transit Circle was found to be defective and was repaired on September 28.

The demolition of the old Magnet House has been completed. The small wooden hut for the electrometer, referred to in the last report, has been erected in the Magnetic Enclosure. All the instruments for the determination of magnetic elements and their variations, the determination of atmospheric electricity, the barometer, recording barograph and thermometers, thermograph and rain-gauges are installed in this enclosure.

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The renewal of the Time-Ball, referred to in the Report for 1914, but postponed on account of the war, has now been taken in hand, together with structural repairs needed to the Ball Turret. A new ball of aluminium, a new winch and part of the raising machinery, supplied by Messrs. E. Dent & Co., and a new teak mast, constructed by the Works Department of the Admiralty, have been at the Observatory since 1914. The installation of the new apparatus and repairs of the turret are now in progress, the old Time-Ball having been put out of use on April 14 and dismounted.

The principal movable instruments are thus distributed :—

At Greenwich—

Transits B, C, D, and E.

Altazimuths D and E.

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

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

Detached Telescopes (on tripod stands).—Two 4-inch (Simms Nos. 1 and 2), two 4-inch (R.O. Nos. 1, mounted as finder on Thompson Equatorial, and 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.

The 13-inch Object Glass of the Astrographic Equatorial, $3\frac{1}{2}$-inch Detached Telescope (R.O. No. 3) and Eros Micrometer to the Joint Permanent Eclipse Committee for the observation of the Solar Eclipse on May 28–29 at Sobral.

Two Heliotropes at the Science Museum, South Kensington.

Photoheliographs :—

No. 1. At the Cape Observatory with the exception of the parts mentioned above.

No. 4 has been permanently transferred to the Kodaikanal Observatory.

No. 5. Object glass on loan to Professor Newall, Cambridge.

Clocks.—Dent No. 1916 and Dent No. 2013, at the Cape Observatory; Dent No. 2011, at the Kew Observatory; Arnold 2, at the University Observatory, Oxford; Graham 2, for use in connection with the Time Ball at Rosyth.

Anemometer.—Whewell's Anemometer, formerly mounted above the roof of the Octagon Room of the Royal Observatory, lent for exhibition at the Victoria and Albert Museum, South Kensington.

On loan to the Royal Observatory—

The Cookson Floating Zenith Telescope from the Cambridge Observatory for a further period of seven years from July 1918.

Two 16-inch cœlostats and a 12-inch cœlostat from the Royal Astronomical Society for use at the total eclipse of the Sun, 1914 August. (At present in Russia, at Pulkovo Observatory.)

A Quartz spectroscope from Prof. H. F. Newall, Cambridge, for the same eclipse. (At present in Russia, at Pulkovo Observatory.)

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

A Watson Quartz-Fibre Vertical Force Magnetograph from the Meteorological Office.

An Adie-type Vertical Force Magnetograph from the late Professor Watson, Imperial College of Science and Technology.

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

The annual examination of the Library has been made as usual, the books on the shelves being compared with the catalogue. Fifteen books are reported missing from the shelves and cannot be accounted for at present, including nine books reported missing last year. Seventeen of the books reported missing last year have been returned.

II.—Astronomical Observations :—

Transit Circle.—The Sun, Moon, planets, and fundamental stars have been regularly observed on the meridian as in previous years. Other stars observed are taken from the list prepared by Dr. Backlund and Mr. Hough, but, owing to the depletion of the staff and exceptionally unfavourable weather, this work has only been carried on to a very limited extent.

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

Transits	3,224	Circle observations	2,818
Collimation	151	Nadir point	366
Level	420	Reflection observations	136

The Sun was observed on 135 days and the Moon on 99 days.

The observations are completely reduced to 1919 April 6.

The planetary ledgers for 1917 and 1918 have been completed.

Since 1915, Zenith distances have been reduced from the Nadir observations alone. Observations of stars by reflection are continued, but are separate from those made directly. A preliminary discussion of the results for the three years 1915, 1916 and 1917 shows that the anomalies which have been found in the R—D observations arise from the reflection observations, and that the direct observations require a correction $+ ''\cdot 60 \sin$ Z.D. The planetary observations since 1915 are reduced with the data: Pulkovo Refractions, Co-latitude $21''\cdot 90$ and a correction $+ ''\cdot 60 \sin$ Z.D. A full discussion of these points will be made when the present catalogue of fundamental stars is completed.

The two catalogues for 1910, one of fundamental stars and the other of stars in the Zone 24–32° N. Dec. are in the printer's hands. During the year much time has been spent on the discussion of the systematic motions of these zone stars, especially in relation to their spectral type, and the results will be given in the Introduction. I again take the opportunity of expressing the obligations the Observatory is under to the kind co-operation of the late Prof. E. C. Pickering and to Miss Cannon for communicating in advance of publication the results of the *Henry Draper Catalogue.*

Altazimuth.—This instrument has been used to supplement the observations of the Moon made with the transit circle. Meridian observations have been made on 27 nights and extra-meridian observations on 6 nights.

In the year ended 1917 Dec. 31, the Moon was observed with one or other of the two instruments on 125 nights. The mean correction in right ascension required by the *Nautical Almanac* is $+0^s\cdot92$, and by the *Connaissance des Temps* (depending on Delaunay's tables as revised by Radau and Andoyer) is $+0^s\cdot28$. These quantities are practically identical with those for 1916 and 1917. The following table gives the mean tabular error of the Moon's longitude for each year since 1883, when Newcomb's Empirical Correction to Hansen's tables was introduced into the *Nautical Almanac*:—

1883	-	− 0″·03	1893	-	− 0″·06	1903	-	− 3″·08	1913	-	− 11″·93
84	-	− 0·16	94	-	− 1·20	4	-	− 3·16	14	-	− 12·86
85	-	− 0·09	95	-	− 1·47	5	-	− 5·29	15	-	− 12·58
86	-	− 0·11	96	-	− 1·68	6	-	− 5·91	16	-	− 14·05
87	-	+ 0·21	97	-	− 2·77	7	-	− 5·96	17	-	− 14·03
88	-	+ 0·76	98	-	− 3·03	8	-	− 5·97	18	-	− 14·05
89	-	− 0·38	99	-	− 2·18	9	-	− 6·41			
90	-	− 0·27	1900	-	− 2·69	10	-	− 7·85			
91	-	+ 0·72	01	-	− 2·77	11	-	− 8·34			
92	-	+ 0·79	02	-	− 3·15	12	-	− 9·79			

Cookson Floating Zenith-Telescope.—During the year 185 photographs have been taken, 178 for latitude groups and 7 for scale determination. The measurement of the photographs to the end of 1918 is completed, and the results for the variation of latitude at Greenwich for 1918 were communicated to the Royal Astronomical Society and published in the *Monthly Notices* for March 1919.

The observations made with the telescope during the past seven years are under discussion. The scale-plates have provided a good determination of the scale of the instrument and of its temperature co-efficient, the values being—

$$5 \text{ mm.} = 623''\cdot26 - 0''\cdot0041\ (T - 43^\circ\cdot5).$$

This value of the temperature coefficient is in almost exact agreement with the value obtained by Mr. Bryan Cookson.

The observations provide a very reliable determination of latitude variation at Greenwich, the discordances from a smooth curve rarely exceeding a few hundredths of a second of arc. The correction to the aberration constant (20″·47), deduced from the seven years' observations, is — 0″·028, giving for the aberration constant 20″·442, and corresponding to a solar parallax of 8″·815. The corrections, resulting from the observations of each separate year, have been determined, and a larger range of variations than had been anticipated is shown. This appears to be due largely to the necessity of including rather poor plates, obtained during long spells of generally cloudy weather. Unfortunately, the aberration factor obtainable during the summer months is considerably smaller than that obtainable in the winter, so that the summer plates, which are generally the best, carry the least weight in the determination of aberration. The possibility of the existence of systematic disturbing causes is being investigated. It is intended to continue observations for a further period of seven years, and the programme of stars has been slightly revised, the majority of the fainter stars having been replaced by brighter stars.

Equatorial Observations.—During the year ended 1919 May 10, 5 disappearances of stars occulted by the Moon and one reappearance of Jupiter I occulted by Jupiter have been observed.

The 28-inch Refractor.—This instrument was at the disposal of M. Jonckheere till he returned to Lille in January. His programme of work consisted of the remeasurement of stars he had previously observed at Lille. The results have been published in the *Astronomical Journal.* He also made observations of Encke's Comet and Wolf's periodical Comet, rediscovering the latter on 1918 July 9. The instrument was brought into use again by the regular staff of the Observatory from the beginning of April, and observations have been made on 7 nights.

Copy for press of the observations from 1910–15 has been completed, and a catalogue of the results since 1893 is in preparation. The part from 0^h—2^h 30^m and 8^h—15^h is completed.

Thompson Equatorial.—The object glass of the 26-inch refractor, which had been dismounted on 1917 September 26, was replaced on 1918 October 15. After a number of experimental plates for adjustment and focus had been made, the photography of the larger satellites of Jupiter for Dr. de Sitter was commenced. At the opposition of December 1918 the satellites were nearly along a parallel of declination, and the epoch was therefore a suitable one for determining the inclinations and nodes of the satellites. 43 photographs were obtained on 26 nights between 1918 October 22 and 1919 March 24.

Photographs for parallax determination were recommenced on 1919 March 13, and 41 plates have been obtained. Instead of retaining the plates for re-exposure at a subsequent epoch, as formerly, the plates are now being developed immediately after exposure. This procedure minimises wastage, and provides the greatest economy of observing time.

Five photometry plates of Kapteyn's Selected Areas have been obtained with the 26-inch refractor since the date of remounting the object glass.

The results for the zone 15° N. Dec. are complete, and copy has been prepared for the printer. These give photographic magnitudes of stars down to $14^m{\cdot}0$ in areas $40' \times 40'$ at each hour of right ascension throughout the zone.

The 30-inch reflector has been used to obtain a few photographs of the Pleiades and of the Orion Nebula for comparison with older photographs. The minor planet Alinda (887) was also photographed on two nights.

Astrographic Equatorial.—Photographs were taken on 47 nights for determination of the magnitude of Nova Aquilæ 1918. Eleven fields in various zones were taken for the purpose of the determination of the Proper Motions by direct comparison with earlier plates.

In addition 9 photographs were obtained of the field which will be in the vicinity of the Sun at the Eclipse of 1919 May 28–29.

The images of Nova Aquilæ and of the comparison stars photographed with it were measured, and the results, giving the variation of magnitude of the Nova

from June 10 to November 7, were communicated to the Royal Astronomical Society in 1918 November, in a paper by Mr. Hollis.

Thirty-four fields have been examined for proper motion of stars by comparison of plates taken at an interval of 20 years.

The examination of all stars in the Greenwich Astrographic Zone which are bright enough to appear in the *Bonn Durchmusterung* for determination of proper motion is now completed, as well as the comparison with all available meridian observations. Copy for press has been prepared giving the proper motions of the stars in Vol. III. of the Greenwich Astrographic results (*i.e.*, stars observed in the Catalogues of the *Astronomische Gesellschaft*) wherever there is sufficient material. A further list has been prepared of the proper motions of the remaining stars in the *Bonn Durchmusterung* between 81° and 65° N. dec. wherever they exceed 7″ a century. This list contains about 550 stars.

Heliographic Observations.—In the year ended 1919 May 10, photographs of the Sun were obtained on 208 days. Of these 392 have been selected for preservation, including 19 with double images of the Sun for the determination of the zero of position angle.

The last photographs taken at the Royal Observatory, Cape of Good Hope, that have been received in duplicate to supplement the series secured at Greenwich were those for 1917 January; but those for later dates have been applied for, and the first consignment should arrive shortly.

H.M. Astronomer at the Cape has reported that the Sun was successfully photographed there on 337 days in the year 1918, and on 53 days in the first two months of 1919. The Director of the Kodaikanal Observatory has reported that plates were taken there on 303 days in the year 1918, and on 89 days during the first three months of 1919.

The measurement of the combined series of Cape and Greenwich photographs has been completed as far as possible—*i.e.* to 1917 January 31. The Greenwich photographs had also been measured up to 1917 May 23 by the date of this report. In order to push on the work of measurement as rapidly as possible, the loan of the Solar Micrometer, constructed for the Solar Physics Committee, and a duplicate of the one in use here, was requested and kindly granted by Prof. Newall. A set of small glass scales is now being prepared for its magnifier by Messrs. Troughton and Simms.

The groups of spots have been measured, and the notes upon them have been written up to 1917 January 13, and all reductions made, and put in form for the printer up to the end of 1915. For 1916, the reductions of positions were confined to the complete groups, the positions of individual spots being reserved for future treatment. The usual annual summaries of results have been prepared for both 1915 and 1916 and have been communicated to the Royal Astronomical Society.

The copy for press of the Daily Results for the first three months of 1915 has been sent to the printer, and proofs of the first sheet have just been received.

During the period covered by this report, the activity of the Sun has been very considerable, but there has been, on the whole, a perceptible decline since the great disturbances of the month of 1917 August.

Solar Eclipse.—The Joint Permanent Eclipse Committee of the Royal and Royal Astronomical Societies was impressed with the importance of sending expeditions to observe the Eclipse of 1919 May 28–29, on account of the specially favourable conditions it presented for the determination of the possible deflection of a ray of light by the gravitational field of the Sun. A sum of money was placed at the Committee's disposal, and preliminary inquiries and arrangements were made in case the war should terminate in sufficient time for the expeditions to be made. It was proposed that two observers should occupy a station at Principe on the W. coast of Africa, and two others should occupy one at Sobral in North Brazil, and that they should take with them the Astrographic Object Glasses of the Oxford University Observatory and the Royal Observatory, if the loan of these valuable telescopes could be obtained. The cessation of hostilities on 1918 November 11 gave sufficient time for these plans to be carried out. Preparations for the expedition were made at Greenwich, where the various instruments were assembled and packed. Mr. Bowen, the Civil Engineer of the Royal Naval College, kindly gave very valuable assistance at a time of great pressure by superintending the construction of observing huts, charging only for labour and materials. He also supplied a joiner who worked with the Observatory staff under Mr. Davidson's directions on the wooden camera ends of the instruments. The metal work, with the exception of the large steel telescope tubes, which were obtained from Messrs. Harvey & Co., was carried out by the Observatory Mechanic. The instruments were mounted, but the weather did not

permit them to be completely adjusted, although the going of the coelostat clocks, which had been overhauled by Mr. Cottingham, was tested. The instruments, observing huts and other equipment were sent to Liverpool on February 20, and the observers left by the S.S. "Anselm," on March 7, Prof. Eddington and Mr. Cottingham for West Africa, Dr. Crommelin and Mr. Davidson for Brazil.

III.—Magnetic Observations :—

The variations of magnetic declination, north force and vertical force have been registered photographically. Absolute observations of declination are made five or six times a week, of horizontal force twice a week, and of dip three times a week. The absolute observations and the photographic records are made in the two buildings in the Magnetic Enclosure.

The thermostat in the Magnetograph room, which had not been working well, was replaced at the beginning of June. It has kept the diurnal change of temperature satisfactorily small, and the control temperature has only fallen 1° Centigrade since that time.

The mean hourly ordinates of the declination, north force and vertical force registers are read off to the end of April 1919, and partly reduced.

The absolute observations are all reduced. The mean values of the magnetic elements for 1918 and three previous years are as follows :—

	Dec. W.	Hor. Force.	Vert. Force.	Dip.
	° ′			° ′
1915 - -	14 56·5	0·18508	0·43315	66 51·8
1916 - -	46·9	·18494	·43313	52·7
1917 - -	37·0	·18477	·43305	53·6
1918 - -	27·7	·18462	·43290	54·2

The annual diminution of declination increased considerably about 1910, its average value from 1900 to 1910 being 4′·9. The horizontal force, which had been increasing since measurements were begun at Greenwich in 1846, reached a maximum about 1910 and is now diminishing. The dip, which has been diminishing since measurements were begun in 1843, reached a minimum about 1913, and is now increasing.

There were no days of very great magnetic disturbance in 1918. The curves of disturbed days to be reproduced in the Volume will be selected from the International list when it is received.

IV.—Meteorological Observations:—

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

The Electrometer has been removed to the Magnetic Enclosure and a radium collector substituted for the water-dripping apparatus. Various experiments have been made with a view to the determination of the most suitable manner of insulating the collector. Some satisfactory experimental traces have been obtained and a permanent installation is now in hand. It is intended to obtain other continuous traces for comparison purposes, using a flame collector in conjunction with a Bendorff Electrometer. Two Kelvin-White multicellular voltmeters are being used for the determination of scale.

The observations of barometer, thermometers, anemometers, rain-gauges and sunshine recorder are entered and reduced to date. On the photographic sheets the hourly ordinates are read off and reduced to the end of April 1919.

The investigation of the lunar diurnal barometer variation at Greenwich has been completed by Dr. Chapman and published in the *Quarterly Journal* of the Royal Meteorological Society.

New daily wind velocity averages have been deduced from 50 years' observations, 1867 to 1916.

The following details of the weather refer to the year ended 1919 April 30. The mean temperature was 49°·5 or 0°·1 below the average of the 75 years 1841–1915. The highest temperature in the shade was 89°·8 on August 22, and the temperature exceeded 80° on 6 days. The lowest temperature was 15°·5 on February 9, and on 55 days fell as low as 32°·0.

The mean daily horizontal movement of the air was 276 miles, which is 8 miles below the average of the 50 years, 1867–1916. The greatest daily movement, 674 miles, was recorded on December 29, and the least, 65 miles, on November 20. The greatest recorded pressure on the square foot was 19·4 lbs.

on May 23; the greatest velocity in one hour, 40 miles, was registered on January 29.

The duration of bright sunshine registered by the Campbell-Stokes instrument was 1,436 hours out of a possible 4,456 hours, or 32·2 per cent.

The rainfall was 31·14 inches, or 6·90 inches above the average for the period 1841–1915. The number of rainy days (0·005 inch or over) was 194, the largest number for 36 years. June with 0·47 inch was the driest, and July with 7·34 inches the wettest month, September with 4·48 inches being also very wet.

V.—Printing and Distribution of Greenwich Publications:—

After the completion of the Greenwich Observations for 1914, printing was temporarily suspended owing to heavy pressure of work on H.M. Stationery Office in connection with demobilisation. The printing of the Observations for 1915 is now proceeding, as well as of the two star catalogues. The 1914 Observations have not yet been distributed. The Clock Star List and Report to the Board of Visitors were printed as usual.

VI.—Chronometers:—

The number of chronometers and watches belonging to the Admiralty now at the Observatory is 2,123. Of this total, 206 chronometers, 175 chronometer watches, 141 hack watches, and 57 pocket watches are being rated. One box chronometer is also being tested for the Indian Government. In addition there are 67 chronometers and watches being rated or under examination.

There are also 24 chronometers, 125 chronometer watches, and 17 hack watches belonging to various makers, now at the Observatory on trial for purchase.

During the year ended 1919 May 10, 8,631 chronometers and watches have been received and 6,713 issued. The number sent for repair was 2,990, including 1 box chronometer belonging to the Indian Government.

Purchases of chronometers and watches for R.N. service have been made after testing for the standard performance required of the several types of instruments. Altogether, 106 chronometers, 329 chronometer watches, 133 large lever watches in gymbals, 156 hack watches and 396 pocket watches have been purchased.

In addition, the purchase of 7 chronometers and 6 hack watches after trial has been made by the Indian Government.

VII.—Time Service :—

Daily time signals have been sent to the General Post Office without failures. The signals from the Eiffel Tower have been received regularly, and a comparison with the Greenwich Clock sent daily to Paris.

On 3 occasions—May 23, June 22, July 18—the Greenwich Time-Ball was not raised on account of the violence of the wind. On June 16, owing to failure to set the clips in position, the ball would not remain at the top of the mast, and was in consequence lowered slowly by hand.

On February 18, although the clips were released by the 13-hour signal, the ball failed to drop. It was lowered slowly by hand about $13^h\ 9^m\ 30^s$.

Owing to the installation of a new Time-Ball and apparatus, the use of the Time-Ball has been discontinued since April 14.

The Time-Ball at Deal, which is released by the 13^h signal from Greenwich, failed to drop accurately on seven occasions.

The performance of the Time-Balls at the Admiralty Signal Stations and of the Westminster Clock is shown by the following table of the errors of the return-signals received at Greenwich :—

Error of Return Signal.	Portsmouth.	Portland.	Devonport.	Westminster.
Not greater than $0^s \cdot 2$	271	259	290	50
Between $0^s \cdot 2$ and $0^s \cdot 5$	12	24	10	46
„ $0^s \cdot 5$ „ $1^s \cdot 0$	2	4	0	55
Greater than $1^s \cdot 0$	0	1	0	79

On the 232 days of observation the error of the Westminster Clock at mid-day exceeded $3^s \cdot 0$ on one occasion. The clocks at Portsmouth, Portland and Devonport are corrected daily by the 10^h signal; the Westminster Clock is not corrected daily.

VIII.—Personal Establishment :—

The permanent staff at the present time is constituted as follows :—
Chief Assistants.—Mr. Jackson, Mr. Jones.
Assistants.—Mr. Bryant, Mr. Crommelin, Mr. Hollis, Mr. Maunder, Mr. Thackeray, Mr. Bowyer (acting).
Clerical Assistant.—Mr. Burkett.
Junior Assistants (Higher Grade).—Mr. Davidson, Mr. Edney.
Junior Assistants.—Mr. Acton, Mr. Cullen, Mr. Furner, Mr. Jeffries, Mr. Melotte, Mr. Newton, Mr. Stevens, Mr. Witchell.

Mr. Jones, who had been lent since 1916 January 3 to the Optical Branch of the Inspection Department of Woolwich Arsenal, resumed his duties at the Royal Observatory on 1918 December 2.

Dr. Chapman, who had rendered voluntary assistance since 1916 May as Honorary Chief Assistant, terminated his valuable services in that capacity on December 15.

His researches on terrestrial magnetism, particularly on magnetic storms and their relationship to other phenomena, have been published in the *Phil. Trans.* and other scientific periodicals.

Mr. Jackson, who holds a commission in the Field Survey (R.E.), has been seconded for duty at the Royal Observatory since 1919 April, pending actual demobilisation.

Messrs. Burkett, Cullen, Melotte, Jeffries and Newton returned to the Observatory between 1919 February 3 and April 14, on being demobilised.

Mr. Outhwaite retired on 1919 May 3, after having carried out the duties of Clerical Assistant with great efficiency for 25 years. He has been succeeded by Mr. Burkett.

Mrs. Maunder has continued throughout the year to give voluntary assistance in the Solar Department.

M. Jonckheere, Director of the Lille Observatory, continued his double-star work with the 28-inch Equatorial until 1919 January 27, when he returned to Lille.

15 Computers are now actually employed at the Royal Observatory, 11 having resumed their duties since 1919 February 1, on being demobilised; 6 others have resigned, and 4 are still retained on military service.

The following table shows the present arrangement of the staff under the general superintendence of the Chief Assistants :—

Branch.	Established Staff.		Temporary Computers.
	Assistants.	Junior Assistants.	
Transit Circle : —			
Meridian Computations	Thackeray	Cullen	*Davis, Symms.
Transit and Zenith Distances		Witchell, Acton	*Percival.
Altazimuth	Crommelin		
Time Signals and Chronometers	Bowyer (acting)	Edney (Higher Grade) Stevens.	*Lambert, Baldwin, Rickett.
Astrographic Equatorial	Hollis		*Barton.
Thompson Photographic Equatorial.		Davidson (Higher Grade).	*Martin.
		Melotte	Vaizey.
28-*inch Equatorial*		Furner	*Sims.
Photoheliograph	Maunder	Newton, Jeffries	*Whitaker.
Magnetic and Meteorological	Bryant		Miss Clack, *Wells, *Tibbetts.
Clerical	Burkett		*Chamberlain.

* Qualified as Observers with one or more of the instruments.

(Messrs. Divers, Barrett, Sharpe and Palmer are absent on military service.)

The staff of workmen now employed at the Observatory consists of a foreman of works with two joiners and two labourers, a mechanic (vacancy) with a boy assistant, a gate-porter, two messengers, a night-watchman, a gardener, a labourer, and a charwoman.

Mr. G. H. Lifton, late Foreman of Works, died on 1919 April 24 after a short illness. His post has been taken by Mr. Woodman. The night-watchman, whose place has been temporarily filled, is absent on military service.

IX.—General Remarks :—

A Conference, appointed by the Admiralty under the Chairmanship of the Hydrographer of the Navy, was held on 1917 June 21 to consider the advisability of adopting a system of Time Zones for time-keeping at sea. The Astronomer Royal attended this Conference as one of the representatives of the Admiralty. Acting upon a recommendation of the Conference, the Lords of the Admiralty have decided to establish in H.M. Navy a uniform method of time-keeping by zones,

generally similar to that used on land. This decision was announced by Admiralty Order No. 1,291, dated 1919 April 9.

The Conference also put forward a recommendation that a day commencing at 0 hours midnight should be substituted in all nautical publications for the astronomical day commencing at 0 hours noon. The Admiralty has decided to adopt this recommendation. The necessary alterations will be made in the *Nautical Almanac* commencing in the year 1925, and in the *Admiralty Tide Tables* for 1920.

The Astronomer Royal attended the meetings of the Inter-Allied Conference on International Scientific Organisations held in London on 1918 October 9, 10 and 11, and in Paris on 1918 November 26 to 29, as one of the British delegates. At these meetings the formation of an International Research Council was decided upon, and draft regulations have been drawn up for the constitution of an International Astronomical Union and of an International Geophysical Union for submission to the delegates of the countries co-operating in these undertakings.

Returning to the special work of the Royal Observatory, it may be said that observations of Sun, Moon and planets, observations for variation of latitude, solar photography, magnetic and meteorological observations have been carried on throughout the war without intermission. With the exception of solar work, where photographs from the Cape and India are still wanted, measurements and reductions are in a forward state. Printing is behindhand, the volume for 1915 being only begun, and efforts are being made to overtake the arrears as soon as possible.

The observing with the transit circle, altazimuth and the 26-inch refractor have been curtailed very considerably. With the return of the Assistants and Computers this is being remedied, though the observers will not be at full strength till Dr. Crommelin and Mr. Davidson return from the Eclipse Expedition.

Much time has been spent during the last few months on the sidereal standard clock. The room in which it is mounted is dry, and a constant temperature is satisfactorily maintained. The barometric adjustment has been overhauled and appears to be working satisfactorily. But the going of the clock is not up to the standard of the best modern clocks, and it will be necessary to obtain a new one. Another instrumental change, which should be made as soon as possible, is a weight-driven and electrically-controlled clock for the 28-inch refractor.

In conclusion, I should like to bear testimony to the readiness with which the younger members of the permanent and temporary staff volunteered for war service, and the efforts made by those who remained to keep the work of the Observatory as efficient as possible under war conditions.

1919 *May* 22. F. W. DYSON.