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the middle of well-marked series, their different amplitudes and periods, could not be explained except by the supposition that the solar action was not continuous, but only by fits periodic.

The author was induced to believe lately that these differences in the oscillations were due to conjoint actions of the sun and moon; he accordingly deduced the mean variations corresponding to three periods of 26, 29·5, and 27·3 days, the times of rotation of the sun derived from the magnetic observations, and of the moon's synodical and tropical revolutions respectively. He finds that the combinations of these three series of variations represent with considerable accuracy all the variations of the daily mean horizontal force of the earth's magnetism during each year; so that the sun's rotation and the different positions of the moon relatively to the sun and the plane of the equator (or of the ecliptic) are found to produce all the differences in the amplitude and time, as well as the apparent disappearance of the oscillation.

Cases of considerable and sudden diminution of the earth's magnetic force which happened in the years 1844 and 1845 are next examined; and it is shown that these changes occur at intervals of 26 days, or multiples of 26 days; in one instance there are five successive recurrences at the exact interval of 26 days.

As this period is that of the sun's rotation *relatively to the earth*, it appears to follow that the earth has some action on the sun, or (more probably) on some ray-like emanation from the sun, which causes these changes in the earth's magnetism.

It is found also that these sudden variations occur more frequently when the moon is at a considerable distance from the equator and the ecliptic; it would thus appear that our satellite has also an action on the cause of the great terrestrial magnetic disturbances.

II. "Results of the Monthly Observations of Magnetic Dip, Horizontal Force, and Declination made at the Kew Observatory from April 1869 to March 1875 inclusive." By the Kew Committee. Received November 25, 1875.

This paper, containing the result of six years' magnetic observations at the Kew Observatory, follows as the third of a series of publications, the first of which was a communication to the Royal Society by General Sir E. Sabine, published in the Philosophical Transactions for 1863, page 273, which consisted of a discussion of certain selected magnetic disturbances, a general discussion of declinational changes as recorded by the magnetographs, and a discussion of the absolute determination of Dip and Horizontal Force at the Observatory, for the six years April 1857 to March 1863 inclusive.

The second publication appeared in 1870 as a paper in the 'Proceedings of the Royal Society,' contributed by Dr. Balfour Stewart, the Superintendent of the Observatory; it contained the results of the monthly observations of Dip and Horizontal Force for the next series of six years, viz. from April 1863 to May 1869.

There is now presented a further series of six years' observations of Dip and Horizontal Force, from April 1869 to March 1875 inclusive, together with observations of absolute declination for the same period.

The instruments employed in the determinations are the same as those described by Sir E. Sabine in the Philosophical Transactions, 1863, page 296, no change worth noticing having been made in either instruments or magnets.

As in the case of the six years discussed by Dr. Stewart, only those dips have been considered which have been made with the two needles Nos. 1 and 2 of circle Barrow No. 33; of these the general practice has been to observe both needles on two successive days in the middle of the month, giving the mean of the four observations as the mean for the month.

The values of the constants employed in the reduction of the observations of vibration and deflection have been redetermined, and found to closely correspond with those found by Mr. Welsh, which are given in the paper quoted above.

Two observations of vibration and two of deflection, at two distances, have been made each month, the mean result being taken as the force for the month.

The Declination observations have been made in the Magnetic Observatory with the Kew 9-inch unifilar and a reversible collimator magnet NE, the instrument being directed after each reading to the reference-marks on the obelisk erected a quarter of a mile to the north of the Observatory as a meridian mark for the transit instrument.

The azimuth of this mark, as viewed from the declinometer, was carefully determined by Mr. Welsh in 1857, and has since been verified both by Mr. Chambers and Mr. Whipple.

After each observation of the magnet it is removed and replaced by a torsion-plummet of equal weight, the position of which is observed when it has come to perfect rest a few hours after the observation.

Should any torsion be found to have been introduced into the thread, a suitable correction is applied to the observation.

Observations have been made at noon on two consecutive days in each month, the mean of which is inserted in the Table.

Dip.

In Table I. we have a record of the observed values of dip made with circle 33 Barrow, each observation being the mean of two made with each of the two needles belonging to that circle.

Table I.

Magnetic Dip as determined at the Kew Observatory.

	1869.	1870.	1871.	1872.	1873.	1874.	Mean of 6 years.
April	68° 2′·6	67° 57′·6	67° 59′·0	67° 53′·8	67° 53′·3	67° 50′·8	67° 56′·18
May	0·7	57·7	56·0	53·8	50·9	49·0	54·68
June	0·4	55·5	[67 56·0]	53·5	51·7	47·1	54·03
July	67 58·9	56·8	55·9	53·0	51·3	50·9	54·49
August ...	59·2	59·0	58·1	52·3	51·1	49·4	54·85
September	68 1·3	68 0·1	67 53·9	67 54·3	67 51·6	67 52·2	67 55·57
	68 0·52	67 57·78	67 56·48	67 53·45	67 51·65	67 49·90	67 54·96

	1869–70.	1870–71.	1871–72.	1872–73.	1873–74.	1874–75.	Mean of 6 years.
October ...	68° 0′·3	68° 1′·0	67° 56′·0	67° 54′·4	67° 52′·4	67° 49′·1	67° 55′·53
November	2·3	67 58·6	57·0	55·0	51·1	50·0	55·67
December	0·2	57·6	55·7	53·5	49·7	50·3	54·50
January ...	0·6	56·4	55·1	53·3	50·9	49·2	54·25
February	67 59·4	57·4	55·3	53·5	50·3	48·9	54·13
March ...	67 59·0	67 58·1	67 55·5	67 52·8	67 50·0	67 48·8	67 54·03
	68 0·30	67 58·18	67 55·77	67 53·75	67 50·73	67 49·38	67 54·68
	68 0·41	67 57·98	67 56·12	67 53·60	67 51·19	67 49·64	67 54·82

The number within brackets is interpolated.

The absolute values of the dip corresponding to the beginning of October in each of the years from 1868 to 1874 and the secular change in each year are as follows:—

				Sec. change.
From April 1868 to	March 1869....	° ′ 68 2·13		′
„ 1869	„ 1870....	0·41		−1·72
„ 1870	„ 1871....	67 57·98		−2·43
„ 1871	„ 1872....	56·12		−1·86
„ 1872	„ 1873....	53·60		−2·52
„ 1873	„ 1874....	51·19		−2·41
„ 1874	„ 1875....	49·64		−1·55

Mean of the six years corresponding to middle epoch, April 1, 1872 .. } 67° 54′·82. Mean secular decrease .. } 2′·15.

The annual variation and semiannular inequality for the same period are as follows:—

Table II.

Date.	Corrections for secular change.	67° 54′·82 ± secular change.	Observed values.	Observed *minus* calculated.	
				April to September.	October to March.
July 1, 1869	+ 5′·91	68° 0′·73	68° 0′·52	− 0′·21	′
Jan. 1, 1870	+ 4·84	67 59·76	0·30	......	+ 0·64
July 1, 1870	+ 3·76	58·58	67 57·78	− 0·80	
Jan. 1, 1871	+ 2·69	57·51	58·18	......	+ 0·67
July 1, 1871	+ 1·61	56·43	56·48	+ 0·05	
Jan. 1, 1872	+ 0·54	55·36	55·77	......	+ 0·41
July 1, 1872	− 0·54	54·28	53·45	− 0·83	
Jan. 1, 1873	− 1·61	53·21	53·75	......	+ 0·54
July 1, 1873	− 2·69	52·13	51·65	− 0·48	
Jan. 1, 1874	− 3·76	51·06	50·73	......	− 0·33
July 1, 1874	− 4·84	49·98	49·90	− 0·08	
Jan. 1, 1875	− 5·91	48·91	49·38	......	+ 0·47
				− 0·39	+ 0·40

These six years show a semiannual inequality in the dip, the mean giving a lower reading by 0′·40 in the six months from April to September, and a higher by 0′·40 in the other six monthis, viz. October to March, than the average for the year.

This amount appears to be variable, the range in the six years ending March 1863 published by Sir E. Sabine being 1′·31, in the six years ending March 1869 discussed by Dr. Stewart but 0′·54, and in the six years now under consideration 0′·80.

The mean annular secular change as deduced from the three series of observations is as follows :—

Epoch.	Mean dip.	Difference.	Mean annual secular change.
April 1, 1860	68° 20′·07		
April 1, 1866	68 6·62	13′·45	2′·26
April 1, 1872	67 54·82	11·80	1·97

Taking the mean secular change from the value for each year, we have

Series 1............ 2′·00
„ 2............ 1·92
„ 3............ 2·15

The probable error of a monthly determination of the dip as found by the method of least squares from the six years' observations, after the application to each observation of the correction for secular and semiannual change, is ±0′·78.

The error in series 1 was ± 0′·71, and in series 2 ± 0′·96.

Horizontal Force.

The monthly values of the horizontal force, as observed by the Kew Unifilar, are given in Table III.

The method of reduction is the same as that used in the two former papers, described in the first.

Table III.

Monthly Values of the Horizontal Component of the Magnetic Force at Kew, computed from the Experiments of Deflection and Vibration with the Collimator Magnet KC 1.

	1869.	1870.	1871.	1872.	1873.	1874.	Mean of 6 years.
April	3·8499	3·8542	3·8599	3·8642	3·8762	3·8801	3·8641
May	3·8504	3·8502	3·8636	3·8723	3·8758	3·8857	3·8663
June	3·8546	3·8560	[3·8622]	3·8688	3·8773	3·8816	3·8668
July	3·8562	3·8619	3·8608	3·8704	3·8794	3·8812	3·8683
August ...	3·8495	3·8660	3·8623	3·8701	3·8785	3·8849	3·8685
September	3·8530	3·8552	3·8646	3·8746	3·8797	3·8768	3·8673
	3·8523	3·8572	3·8622	3·8701	3·8778	3·8817	3·8669

	1869–70.	1870–71.	1871–72.	1872–73.	1873–74.	1874–75.	Mean of 6 years.
October ...	3·8544	3·8519	3·8700	3·8731	3·8691	3·8843	3·8671
November	3·8567	3·8621	3·8647	3·8641	3·8746	3·8815	3·8673
December	3·8473	3·8575	3·8657	3·8735	3·8856	3·8810	3·8684
January...	3·8576	3·8590	3·8682	3·8698	3·8768	3·8846	3·8693
February	3·8529	3·8634	3·8594	3·8747	3·8792	3·8882	3·8696
March ...	3·8783	3·8642	3·8672	3·8790	3·8803	3·8833	3·8754
	3·8579	3·8597	3·8659	3·8724	3·8776	3·8838	3·8695
	3·8551	8·8585	3·8640	3·8712	3·8777	3·8828	8·8682

The number within brackets is interpolated.

The absolute values of the horizontal force corresponding to the beginning of October in each of the years from 1869 to 1874 and the secular change in each year are as follows:—

Table IV.

					Secular change.
From April 1869	to March	1870........	3·8551		
,,	1870	,,	1871........	3·8585	+·0034
,,	1871	,,	1872........	3·8640	+·0055
,,	1872	,,	1873........	3·8712	+·0072
,,	1873	,,	1874........	3·8777	+·0065
,,	1874	,,	1875........	3·8828	+·0051

Mean of the six years corresponding to the middle epoch, April 1, 1872 } 3·8682. Mean secular change.... } +·0055.

In order to exhibit semiannual inequality in the horizontal force, Table V. has been formed in a similar manner to Table II.

Table V.

Date.	Correction for secular change.	3·8682 ± secular change.	Observed values.	Observed *minus* calculated.	
				April to September.	October to March.
July 1, 1869	− 0·0152	3·8530	3·8523	− ·0007	
Jan. 1, 1870	− 0·0125	3·8557	3·8579	......	+ ·0022
July 1, 1870	− 0·0097	3·8585	3·8572	− ·0013	
Jan. 1, 1871	− 0·0070	3·8612	3·8597	......	− ·0016
July 1, 1871	− 0·0042	3·8640	3·8622	− ·0018	
Jan. 1, 1872	− 0·0014	3·8668	3·8659	......	− ·0009
July 1, 1872	+ 0·0014	3·8696	3·8701	+ ·0005	
Jan. 1, 1873	+ 0·0042	3·8724	3·8724	......	·0000
July 1, 1873	+ 0·0070	3·8752	3·8778	+ ·0026	
Jan. 1, 1874	+ 0·0097	3·8779	3·8776	......	− ·0003
July 1, 1874	+ 0·0125	3·8807	3·8817	+ ·0010	
Jan. 1, 1875	+ 0·0152	3·8834	3·8838	......	+ ·0004
Mean difference between the observed and calculated values in the respective semiannual periods.........				·0000	·0000

Table IV. shows the mean annual secular change during the last six years to have been precisely the same as during the six years previous, and slightly greater than in the period 1857 to 1863, when it was ·0053.

Table V. also agrees with Table VII. in Dr. Stewart's discussion, in not exhibiting any trace of semiannnal inequality, thereby differing from Sir E. Sabine's paper, in which for the years 1857 to 1863 an inequality amounting to ·0026 was shown to exist.

The probable error of a monthly determination of the horizontal force as determined by least squares from the six years series, after the correction for secular change has been applied to each observation, is ±·0024.

Total Force.

We find in Table III. that the means of the April to September values of the *horizontal* component of the force in the six years is 3·8669, corresponding in epoch to January 1, 1872, and in Table I. that the mean of the April to September values of the dip in the same six years is 67° 54′·96, corresponding to the same epoch.

We find also in Table III. that the means in the six years of all the October to March values are for the horizontal force 3·8695, and for the dip 67° 54′·68, corresponding to epoch July 1, 1872.

These values may be reduced to a common epoch by applying to the former dip the correction of −1′·07 as the proportional part of the secular change as determined by the whole six years' observations.

Correcting in a similar manner the horizontal force for the same period, we get:—

	Horiz. Force.	Dip.
From the April to September observations (reduced to epoch July 1, 1872)	3·86965	67° 53′·89
And from the October to March observations (reduced to the same epoch)	3·86950	67 54·68

We have then for the total force derived from the first series 3·86965 sec 67° 53′·89 = 10·28463 British units, and for the second series 3·86950 sec 67° 54′·68 = 10·29013, showing thus a difference of 0·00550 as the measure of the greater intensity of the terrestrial magnetic force in the October and March period than in the April to September period.

The amount determined from the first six years' observations by Sir E. Sabine was 0·00317; the second six years, 1863 to 1869, gave 0·00363.

Absolute Declination.

The observations of declination made with the Kew Unifilar during the periods corresponding to those for which the force and dip observations were discussed have not been published, a much more elaborate series of observations being available in the records of the Kew self-recording Declinometer.

These were fully treated by Sir E. Sabine for the years 1857 to 1862 inclusive, in the Philosophical Transactions for 1863, page 290; and a paper carrying the investigation up to the end of 1873 is now in course of preparation.

We here give the results of the observations made monthly, in a form similar to that in which the force and dip observations are drawn up.

Table VI.

The Monthly observations of Absolute Declination at noon, observed with the Declinometer.

Month.	1869.	1870.	1871.	1872.	1873.	1874.	Mean of six years.
April	20° 31′ 23″·3	20° 25′ 49″·2	20° 17′ 59″·0	20° 8′ 49″·4	20° 2′ 8″·0	19° 51′ 21″·1	20° 12′ 55″·00
May	20 33 35·8	20 32 17·2	20 16 43·3	20 3 21·9	19 53 19·1	19 53 38·8	20 12 9.35
June	20 33 39·2	20 25 5·5	[20 16 48·8]	20 10 43·6	19 56 45·3	19 49 44·4	20 12 7·80
July	20 34 39·8	20 25 45·7	20 16 54·4	20 10 11·7	20 1 43·4	19 49 35·0	20 13 8·33
August ...	20 30 44·5	20 23 18·4	20 20 5·8	20 6 54·3	19 55 5·7	19 49 23·5	20 10 55·03
September	20 24 51·8	20 24 24·2	20 15 59·0	20 7 20·4	19 59 49·2	[19 49 29·8]	20 10 19·02
	20 31 29·07	20 26 6·72	20 17 24·72	20 7 53·55	19 58 8·45	19 50 32·05	20 11 55·76

Table VI. (*continued*).

Month.	1869–70.	1870–71.	1871–72.	1872–73.	1873–74.	1874–75.	Mean of six years.
October ...	20° 27′ 7″·0	20° 20′ 48″·0	20° 19′ 2″·4	20° 3′ 38″·4	19° 52′ 58″·7	19° 49′ 35″·4	20° 8′ 51″·65
November.	20 31 48·5	20 15 25·3	20 9 48·8	20 4 30·2	19 49 44·5	19 46 7·9	20 6 14·20
December .	20 22 28·0	20 17 26·2	20 7 5·2	20 1 31·4	19 54 0·4	19 41 19·2	20 3 58·40
January ...	20 24 28·9	20 17 29·0	20 7 49·1	20 2 25·1	19 54 8·0	19 47 54·5	20 5 42·43
February .	20 24 40·8	20 18 5·6	20 8 57·0	20 4 2·4	19 51 12·1	19 47 58·9	20 5 49·47
March ...	20 29 5·4	20 19 22·6	20 12 6·0	20 4 59·9	19 58 47·2	19 46 41·1	20 8 30·37
	20 26 36·43	20 18 6·12	20 10 48·08	20 3 31·23	19 53 28·48	19 46 36·17	20 6 31·09
	20 29 2·75	20 22 6·42	20 14 6·40	20 5 42·39	19 55 48·46	19 48 34·11	20 9 13·42

The absolute values of the Declination, corresponding to the beginning of October in each of the years comprehended in Table VI., and the secular change in each year are:—

		Secular change.
From April 1869 to March 1870	20° 29′ 2″·75	
„ 1870 „ 1871	22 6·42	−6′ 56″·33
„ 1871 „ 1872	14 6·40	−8 0·02
„ 1872 „ 1873	5 42·39	−8 24·01
„ 1873 „ 1874	19 55 48·46	−9 53·93
„ 1874 „ 1875	48 34·11	−7 14·35

Mean of the six years corresponding to the middle epoch, April 1, 1872...... } 20° 9′ 13″·42. Mean secular decrease... } −8′ 5″·72.

The semiannual inequality is exhibited in the following Table:—

Table VII.

Date.	Correction for secular change.	20° 9′ 13″·42 ± secular change.	Observed.	*Minus* calculated. April to September.	*Minus* calculated. October to March.
July 1, 1869	+22′ 15″·73	20° 31′ 29″·15	20° 31′ 29″·07	−0′ 0″·08	
Jan. 1, 1870	+18 12·87	27 26·29	26 36·43	......	−0′ 49″·86
July 1, 1870	+14 10·01	23 23·43	26 6·72	+2 43·29	
Jan. 1, 1871	+10 7·15	19 20·57	18 6·12	......	−1 14·45
July 1, 1871	+ 6 4·29	15 17·71	17 24·72	+2 7·01	
Jan. 1, 1872	+ 2 1·43	11 14·85	10 48·08	......	−0 26·77
July 1, 1872	− 2 1·43	7 11·99	7 53·55	+0 41·56	
Jan. 1, 1873	− 6 4·29	3 9·13	3 31·23	......	+0 22·10
July 1, 1873	−10 7·15	19 59 6·27	19 58 8·45	−0 57·82	
Jan. 1, 1874	−14 10·01	55 3·41	53 28·48	......	−1 34·93
July 1, 1874	−18 12·87	51 0·55	50 32·05	−0 28·50	
Jan. 1, 1875	−22 15·73	46 57·69	46 36·17	......	−0 21·52
Mean difference between the observed and calculated values in the respective semiannual periods......... }				+0 40·91	−0 40·90

The mean annual secular change observed, 8′ 5″·72 declination diminishing, is larger than that determined by Sir E. Sabine, which was 7′ 39″; but this is only in accordance with the opinion expressed in the former paper, where it is shown that the secular change is a variable one, and is probably now becoming progressively more rapid.

The semiannual inequality is also largely increased, being now 81″·80, whereas between 1857 and 1862 it was only 58″·85; possibly part of this difference may, however, be due to the fact of the observations now under notice having only been made at isolated periods, whilst the latter result was obtained from the hourly readings of the magnetograph recording the declination continuously.

The observations discussed in this paper have been made and reduced by Mr. G. M. Whipple, B.Sc., Magnetic Assistant, and Messrs. Callum, Power, and Figg, observers, under his supervision.

III. "Contributions to the Minute Anatomy of the Thyroid Gland of the Dog." By E. Cresswell Baber, M.D. Lond. Communicated by Dr. Klein, F.R.S. Received December 9, 1875.

(Abstract.)

The minute structure of the thyroid gland generally, and of its lymphatics in particular, are subjects still but imperfectly understood. With the view of elucidating the latter, the following research was made on the thyroid gland of the dog. The research was carried out under the direction of Dr. Klein. On injecting the lymphatics of this organ with Berlin blue, by the method of puncture, they present the following characters :—

Traversing the gland, chiefly in a longitudinal direction, are large *lymphatic vessels* provided with valves. In direct connexion with these, and permeating the gland in all directions, is a dense meshwork of *lymphatic tubes* and *spaces*. The smaller lymphatic tubes run between individual gland-vesicles, the larger between groups of the same. They accommodate themselves accurately to the intervals left between the vesicles, and where the intervals are larger they expand into irregularly shaped lymphatic spaces. They present no appearance of terminating in blind extremities as stated by some authors. Injections with nitrate of silver show the lymphatic vessels, tubes, and spaces to be all lined with a continuous layer of endothelial plates.

During this investigation it became necessary to study more carefully the interalveolar tissues. This led to the discovery in them of a tissue which does not appear to have yet been described. This tissue, which is designated by the author by the name of "*parenchyma*," consists of large rounded cells, each provided with an oval nucleus, found either singly or in groups amongst the epithelial cells. From