

on a pair of large hind limbs, the weight thereupon being transferred by a larger proportion of the vertebral column than in the prone crawling crocodiles and lizards of the present day.

The author, from certain associated fossils, deduces a probability of the triassic age of the sandstones including the above-described South African Reptilia, and remarks that it is in a sandstone of triassic age in Shropshire where fossil remains occur of a reptile which, in biting with trenchant edentulous jaws, also pierced its prey by a pair of produced weapons analogous to the tusks of *Dicynodon*. Of this reptile, the *Rhynchosaurus articeps*, Ow., the author describes the skull, vertebræ, and some other bones, which have been lately discovered in the New Red Sandstone of Grinsill, Shrewsbury. The remains of the limb-bones in this specimen bespeak a reptile capable of progression on dry land, as well as of swimming in the sea—of one that might leave impressions of its foot-prints on a tidal shore.

This paper is illustrated by numerous drawings.

February 27, 1862.

Major-General SABINE, President, in the Chair.

The following communications were read :—

- I. “Notices of some Conclusions derived from the Photographic Records of the Kew Declinometer, in the years 1858, 1859, 1860, and 1861.” By Major-General EDWARD SABINE, P.R.S. Received February 6, 1862.

The discussion of the magnetic observations which have been made in different parts of the globe may now be considered to have established the three following important conclusions in regard to the magnetic disturbances : viz., 1. That these phenomena, whether of the declination, inclination, or total force, are subject in their mean effects to periodical laws, which determine their relative frequency and amount at different hours of the day and night. 2. That the disturbances which occasion westerly and those which occasion easterly deflections of the compass-needle, those which increase and those which decrease the inclination, and those which increase and those which decrease the magnetic force have all distinct and generally different periodical laws. 3. That there exists a periodical

variation in the relative amount of disturbance in different years, constituting a cycle of about ten terrestrial years, which has been found to correspond, both in the duration of the period and in the epochs of maxima and minima, with a periodical variation in the appearance of spots on the solar disk.

In the introductions prefixed to the several volumes containing the observations made at the colonial observatories, the concurrent testimony of the disturbances of the three magnetic elements to these conclusions is fully exhibited; and in reference particularly to the third, viz. the decennial variation, a *résumé* has been given in the second St. Helena volume, pages cxxii to cxxxvi.

In that *résumé*, the particular form of the previously announced decennial variation is more fully traced, and, from the analysis of the observations, shown to be of the following character. If we begin with the part of the cycle to which the maximum of disturbance belongs, we find, first, three consecutive years in each of which the aggregate amount of disturbance (measured from a constant value) is nearly the same; then, two years of diminished disturbance; and then, three years in each of which the aggregate amount is nearly the same, but is considerably less than in the two preceding years, and very considerably less than in the three commencing years. The three years of minimum are then succeeded by two of medium disturbance, and these by the recommencement of three years of maximum amount. Thus, for example, referring to the years in which the colonial observatories were in action, 1841 and 1842 were years of medium disturbance; 1843, 1844, and 1845 years of minimum, differing little from each other; 1846 and 1847 years of medium, and 1848, 1849, and 1850 years of maximum. The general analogy of these particular features with Schwabe's observations of the solar spots, commenced in 1826 (showing, on the one hand, the number of groups of spots, and on the other hand, the number of days free from spots in each year), may be examined by a reference to the table in the third volume of 'Cosmos' (English translation), page 292, and is as satisfactory as, from the nature of the subject, could well be expected*.

* The variation in the aggregate amount of disturbance in the years of minimum, 1843, 1844, and 1845, compared with the two years of medium immediately preceding, 1841 and 1842, and with the two years of medium immediately

The discontinuance of the colonial observatories occasioned a temporary suspension of investigations which are now admitted to have been of very high interest; but by the liberality and public spirit of the British Association, and by the aid of occasional grants of money from the Royal Society, apparatus for their resumption was completed at the Kew Observatory in 1857, and the investigations were recommenced on the 1st of January, 1858. The results obtained from the photographic records of the Kew declinometer in 1858 and 1859, with a full description of the methods and processes employed in their elicitation, were communicated to the Royal Society in 1860, and are printed in vol. x. of the 'Proceedings,' pp. 624-643. The two years which have since elapsed have furnished similar results for the years 1860 and 1861, strictly comparable with those of 1858 and 1859, having been obtained with the same instruments and by the same methods. We have now, therefore, the observations of four consecutive years from the Kew Observatory, and we are thereby enabled to infer, by the comparison of the aggregate amount of disturbance in each of those years, the progression of the decennial variation up to the close of 1861. The aggregate amounts of disturbance in the four years were severally as follows:—

1858, January 1 to December 31,	7263·7 mins. of arc.
1859, " "	7637·3 "
1860, " "	7540·2 "
1861, " "	6461·6 "

The observations of preceding years had led to the expectation that 1858, 1859, and 1860 would be the three years of maximum, in which succeeding, 1846 and 1847, is well shown by the results of the hourly observations made in those years at the Hobarton Magnetic Observatory.

					Minutes of arc.
1841, Jan. 1 to Dec. 31; aggregate values					5441·9
1842, " " "					4080·8
1843, " " "					2183·4
1844, " " "					2948·6
1845, " " "					2563·7
1846, " " "					3735·5
1847, " " "					4883·4
					4761·4.
					2565·2.
					4309·5.

The aggregate values which are here given are the amounts in each year of the disturbances exceeding 2°13', reckoned from the normals of the several months and hours.

the aggregate amounts of disturbance would differ but little, and that 1861 would be the first year of medium, showing an aggregate amount of disturbance considerably below 1858, 1859, and 1860. This expectation has been realized; and we have now before us the prospect that the present year, 1862, will prove to be the second year of medium, with an aggregate amount of disturbance nearly resembling that in 1861, but a little less; and that 1863, 1864, and 1865 will be years of minimum, differing little from each other in the amount of disturbance, and all lower than the preceding years 1861 and 1862 on the one hand, or the succeeding years 1866 and 1867 on the other. Hence we see the importance of maintaining, during the remaining portion of the decennial period, the photographic records of the Kew Observatory, with as little change as may be practicable in the instruments and methods which have been employed during the first portion.

The Table which is printed in vol. x. of the Proceedings, page 627, shows the aggregate values of the disturbances in 1858 and 1859 distributed into the several solar hours of their occurrence, and distinguishing between the disturbances which produce westerly and those which produce easterly deflections of the compass-needle. It also exhibits the ratios of disturbance at the several hours to the mean of the 24 hours taken as the unit. The subjoined Table contains the same particulars for the *four* years, 1858 to 1861, inclusive. It has of course a somewhat higher authority than the earlier table, inasmuch as ratios obtained from the records of four years are to be preferred to those derived from two years only. But the principal point of interest in comparing them with each other is the evidence which their correspondence affords, of the substantial truth of the two first of the three general conclusions adverted to in the commencement of the present communication, viz., the periodicity of the disturbances in respect to the several hours of solar time, and the distinct character of the laws which regulate the disturbances producing westerly deflections, and those producing easterly deflections. The principal features of both classes of disturbance are the same, whether viewed in the record of the two or of the four years. Regarded from either point of view, both classes follow progressions manifestly dependent upon the hours of solar time, the progressions of the westerly and those of the easterly deflections being as manifestly governed by distinct and

different laws. The westerly deflections have their chief prevalence from 5 A.M. to 5 P.M., or during the hours of the day, the ratios at all the other hours being below unity. The easterly deflections, on the other hand, prevail chiefly during the hours of the night, the ratios being for the most part below unity at the hours when the westerly are above unity, and, conversely, above when the westerly are below. The easterly have one decided maximum at 11 P.M., towards which they steadily and continuously progress from 5 P.M., and from which they as steadily, and continuously, recede until 5 A.M. the following morning. The westerly appear in both records to have a double maximum, one about 6 or 7 A.M., the other about 2 or 3 P.M.

TABLE showing the aggregate Values of the larger Disturbances of the Declination at the different hours of solar time in 1858, 1859, 1860 and 1861, derived from the Kew Photographic Records; with the Ratios of Disturbance at the several hours to the mean hourly value taken as the Unit.

Local astronomical time.	Westerly deflections in four years.		Easterly deflections in four years.		Ratios in two years.		Local civil time.
	Aggregate values.	Ratios.	Aggregate values.	Ratios.	Westerly.	Easterly.	
Hours.	Min. of arc.		Min. of arc.				Hours.
18	860.5	1.55	210.9	0.33	1.85	0.37	6 A.M.
19	904.9	1.63	221.1	0.34	1.83	0.38	7 A.M.
20	769.7	1.38	219.8	0.34	1.48	0.36	8 A.M.
21	732.1	1.32	234.3	0.36	1.23	0.38	9 A.M.
22	640.0	1.15	245.7	0.38	1.26	0.33	10 A.M.
23	696.3	1.25	228.9	0.35	1.21	0.39	11 A.M.
0	855.5	1.54	234.7	0.36	1.38	0.54	Noon.
1	947.0	1.70	218.3	0.34	1.44	0.48	1 P.M.
2	941.6	1.69	263.6	0.41	1.53	0.54	2 P.M.
3	954.5	1.72	197.5	0.30	1.71	0.34	3 P.M.
4	847.1	1.52	265.7	0.41	1.35	0.44	4 P.M.
5	595.1	1.07	332.6	0.51	1.15	0.51	5 P.M.
6	458.7	0.82	477.8	0.74	0.94	0.91	6 P.M.
7	272.0	0.49	798.6	1.23	0.37	1.19	7 P.M.
8	196.0	0.35	962.6	1.49	0.22	1.56	8 P.M.
9	230.9	0.42	1184.1	1.83	0.29	1.79	9 P.M.
10	148.6	0.27	1512.8	2.33	0.20	2.25	10 P.M.
11	121.9	0.22	1615.2	2.49	0.12	2.38	11 P.M.
12	266.5	0.48	1471.3	2.27	0.49	2.21	Midnight.
13	245.7	0.44	1352.7	2.09	0.47	1.98	1 A.M.
14	306.7	0.55	1291.9	1.99	0.49	1.80	2 A.M.
15	287.6	0.52	988.0	1.52	0.51	1.45	3 A.M.
16	407.1	0.73	702.7	1.08	0.97	0.95	4 A.M.
17	662.9	1.19	322.5	0.50	1.53	0.45	5 A.M.
Mean hourly values }		556.2=1.00	648.1=100				

The main object of the Table is to exhibit the amounts of disturbance and the ratios at the several hours, derived from the photographic records of the four years; but, in order to facilitate the examination of the correspondence in these respects of the results severally deducible from the two and from the four years, the ratios of westerly and of easterly disturbance at the different hours which were derived from the photographic records in 1858 and 1859 are added, being reproduced from the table in vol. x.

In discussions published elsewhere the preponderance of westerly over easterly deflection, or the converse, has been inferred to be a *geographical characteristic* rather than an accidental feature. All the stations in North America, at which investigations have hitherto been made, concur in showing a considerable predominance of easterly deflections, whilst at Pekin in Northern Asia the converse is observable. Regarding Kew as the only representative station in the British Islands (the only one in which this investigation has been made), it is deserving of notice, that we find in this locality no constant or decided predominance of either class of disturbance over the other. There is indeed a slight preponderance of easterly values on the average of the four years, but not of such amount or regularity as to give it the character of a decided feature.

II. "On the Action of Chloride of Iodine on Iodide of Ethylene and Propylene Gas." By MAXWELL SIMPSON, M.B. Communicated by Dr. FRANKLAND. Received February 18, 1862.

I have already shown* that the cyanides of the diatomic radicals can be prepared by submitting their bromides to the action of cyanide of potassium. In the hope of forming the cyanides of the triatomic radicals in a similar manner, I subjected the bromides of several of these latter radicals to the action of the same reagent. Finding, however, the reaction not quite satisfactory, it occurred to me that the iodides of these radicals might possibly yield better results. With this view I endeavoured to prepare the triiodide of aldehydene ($C_4 H_3 I_3$), by exposing iodide of ethylene to the action of chloride

* Philosophical Transactions, 1861, p. 61.