

other in that of the British Islands, the former being stationary, the latter in motion; and as it is said now to be Siberia, its motion must have been from west to east. On the other hand, we find this motion described as being in the opposite direction, viz., from east to west. Sir George Airy, in his treatise on Magnetism, p. 93, remarks "that at Greenwich the dip and total force are diminishing. Interpreting these by the remarks, it would seem that the magnetic equator is approaching above Greenwich, or the north magnetic pole is receding from Greenwich; and remarking also the westerly change in direction of north magnetic meridian, from the sixteenth century to the year 1824, and its subsequent easterly motion, it would seem that the north magnetic pole has rotated round the terrestrial pole in a small circle from east to west, and, having passed the point where its westerly azimuth, as viewed from Greenwich, is maximum, is still continuing its course in that circle. It seems probable that in the fifteenth or sixteenth century it was situated between North Cape and Spitzbergen. It is now north-west of Hudson's Bay."

The north magnetic pole, which Sir E. Sabine supposes to have been in Halley's time in the meridian of the British Islands, would appear to be the same which Sir G. Airy says was probably in the 13th and 16th century in a meridian between North Cape and Spitzbergen; yet the pole referred to is in one case said to be now in Siberia; while in the other it is said to be to the north-west of Hudson's Bay; but it cannot at the same time have gone to the eastward and also to the westward.

In the two accounts there is a discrepancy, but perhaps this is apparent only, and some of your readers may be able to show how the accounts can be reconciled. X

Height of Thunderclouds

A FEW days ago I had an opportunity of estimating the height of a bank of thunderclouds, an account of which may interest the readers of NATURE.

I was camped at Gurpur, a place some eight miles from and within sight of the sea, with an elevation of about 480 feet. The evening was fine, and the horizon to westward remarkably free from haze, so much so that when the sun dipped it was still too bright for the naked eye to bear. Some fifteen or eighteen miles to eastward a heavy thunderstorm was raging, and the Western Ghâts were shrouded by immense masses of cumulus, which, piled up to an enormous height, and rosy with the beams of the setting sun, formed quite a study for an artist.

Having been in the jungles for three or four weeks, I noted, in order to get correct time, the moment the sun disappeared beneath the horizon. This was, by my watch, six minutes past six o'clock. A few minutes subsequently I noticed the earth-shadow creeping up the clouds to eastwards, its edge being singularly well-defined by the contrast of the cold grey beneath and the warm colouring above. Struck by the slow progress of the shadow, I timed it, and found that at seventeen minutes past six the last tinge of pink faded from the highest point of the cumulus, and at nineteen and a quarter minutes the cirri floating above the storm lost their hue, thus giving eleven minutes for the former and thirteen and a quarter for the latter. These times reduced and corrected for latitude (130° N.), give the respective approximate heights of the clouds as 14,075 and 25,590 feet, or, adding height of observer, about 2.75 and 4.93 miles.

To be on the safe side, but 10' of arc have been allowed for the eastward position of the clouds. The nature of the observations of course renders correction for refraction unnecessary, so that the above figures are well within the mark.

I believe that in the tropics cumuli attain a considerably greater elevation than is generally believed. In 1864 I was on board a vessel in lat. 2° 53' N., long. 10° 47' W., when there were constant flashes of forked lightning visible among detached clouds directly overhead, yet not the faintest growl of thunder was heard by anyone on board, although a dead calm prevailed at the time. This fact I can only attribute to the combined effect of the immense altitude of the clouds and the consequent rarity of the air.

E. H. PRINGLE

Mangalore, South Canara, Nov. 2

PERIODICITY OF RAINFALL

HAVING been working at the above subject for the last ten years, it occurs to me that a brief record of my failures and successes will form an appropriate sup-

plement to the important article by Mr. Lockyer in NATURE for Dec. 12.

Meteorologists have been hunting for a Saros throughout the present century. Among them, perhaps, the most devoted to the subject were Lieut. George Mackenzie, author of "The System of the Weather," and Luke Howard, whose "Cycle of Eighteen Years in the Seasons of Britain" is a well-known work.

What little I have done in the subject is briefly told. Almost immediately after commencing the collection of British rainfall statistics, which has now reached a completeness excelling that of any other country, my attention was naturally drawn to the question of periodicity. Knowing, however, something of the care requisite to obtain long series of observations strictly comparable, I waited five years before printing anything bearing upon it; in 1865, however, I prepared and published* the following table for fifty years, based upon the mean of continuous records in different parts of Great Britain:—

TABLE I.—MEAN DEPTH OF RAIN AT TEN STATIONS, 1815—1864

Year.	Depth.	Year.	Depth.	Year.	Depth.	Year.	Depth.
1815	27.12	1825	26.57	1835	28.56	1845	27.87
1816	29.26	1826	23.76	1836	33.49	1846	29.57
1817	29.73	1827	29.53	1837	24.54	1847	25.80
1818	30.34	1828	33.02	1838	27.11	1848	35.98
1819	30.46	1829	28.70	1839	31.27	1849	28.51
1820	24.53	1830	30.83	1840	24.67	1850	26.35
1821	29.92	1831	32.28	1841	33.51	1851	26.70
1822	26.63	1832	26.20	1842	25.53	1852	35.53
1823	31.09	1833	29.71	1843	30.40	1853	27.38
1824	30.91	1834	24.52	1844	23.72	1854	22.38
Mean.	28.999		28.512		28.280		28.607
							26.601

I also called attention to two features in this table, which strongly tend towards the confirmation of Mr. Meldrum's views, viz.:—(1) that the wettest years are 1836, 1841, 1848, 1852, and 1860; (2) that of these, all but two form a 12-year period, viz., 1836, 1848, 1860, to which we may now add 1872 †; (3) that the dry years were 1826, 1834, 1844, 1854, 1855, 1858, and 1864; (4) that of these, all but three form a 10-year period, viz., 1834, 1844, 1854, and 1864.

All this looked very satisfactory; but, to make assurance doubly sure, I determined to make up a longer period. This I accordingly did; and the approximate fluctuation of annual rainfall during one hundred and forty years, viz., 1726 to 1865, will be found in the British Association Report for 1866, page 286, *et seq.* These values were converted into ratios, and, subsequently, those for the years 1866 to 1869 were added, and the table was given in the following condensed form in an article on the "Secular Variation of Rainfall in England since 1725,"

TABLE II.—RATIO OF THE FALL OF RAIN IN EACH YEAR SINCE 1725 TO THE MEAN FALL OF SIXTY YEARS, ENDING WITH 1869

Year.	1720	1730	1740	1750	1760	1770	1780	1790	1800	1810	1820	1830	1840	1850	1860
0	...	88	65	61	70	108	75	86	90	100	92	111	89	91	122
1	...	71	58	108	87	70	79	105	96	98	109	108	128	88	92
2	...	83	65	82	71	111	131	117	91	97	100	98	91	138	107
3	...	71	60	87	118	113	93	86	77	92	117	106	110	101	89
4	...	114	89	76	101	129	96	104	85	92	117	90	85	74	73
5	...	102	80	83	82	123	77	84	75	99	96	99	97	88	108
6	109	101	70	100	77	107	107	83	96	107	77	118	108	93	115
7	102	110	95	93	91	89	96	106	94	100	102	87	90	97	103
8	109	70	65	84	128	102	65	88	90	102	120	90	130	80	102
9	97	89	59	81	86	83	116	106	88	99	102	107	98	102	104
Mean	...	89.9	70.6	85.5	91.1	103.5	93.5	96.5	88.2	98.6	103.2	101.4	102.6	95.2	101.5

in "British Rainfall, 1870." I was so disappointed at the total disappearance of both the ten- and twelve-year periods, that I cannot say that I have closely scrutinised

* Brit. Assoc. Report, 1865, p. 202.

† See Times, Nov. 12 and Dec. 3, 1872.