

## CORRESPONDENCE.

## RATE OF SUBAËRIAL DENUDATION.

SIR,—Referring to Mr. Davison's paper in the September Number of the *GEOLOGICAL MAGAZINE*, it will not do, as I have endeavoured to show in "Stellar Evolution," to take the average rate of denudation of the seven river basins which he names, as in any way representing the mean denudation of the whole earth. The majority of these rivers are exceptionally muddy, indicating a very high rate of denudation: much above that of the whole earth.

PERTH.

JAMES CROLL.

## THE FULLERS EARTH OF NUTFIELD.

ERRATUM.—Mr. P. Gerald Sanford regrets that some mistakes occurred in the setting up of the figures of his analysis of the "Fullers' Earth." *GEOL. MAG.* October, 1889, p. 456, which he desires now to correct.

## No. 1. BLUE EARTH.

Dried at 100° C		Insoluble Residue.		
Insoluble Residue	= 69·96	per cent. =	{ SiO <sub>2</sub> = 62·81 per cent.	
Oxide of iron, Fe <sub>2</sub> O <sub>3</sub>	= 2·48	}	Al <sub>2</sub> O <sub>3</sub> = 3·46 "	
Alumina, Al <sub>2</sub> O <sub>3</sub>	= 3·46		Fe <sub>2</sub> O <sub>3</sub> = 1·30 "	
Lime CaO	= 5·87		CaO = 1·53 "	
Magnesia, MgO	= 1·41		MgO = 0·86 "	
Phosphoric acid, P <sub>2</sub> O <sub>5</sub>	= 0·27		} Soluble in acid.	69·96
Sulphuric acid, SO <sub>3</sub>	= 0·05			
Sodio Chloride, NaCl	= 0·05			
Alkalies, K <sub>2</sub> O	= 0·74			
Combined Water	= 15·57			
	99·86			

P. G. SANFORD.

## OBITUARY.

CHARLES SPENCE BATE, L.D.S.R.C.S. ENGL., F.R.S., ETC.

BORN 16 MARCH, 1818; DIED 29 JULY, 1889.

CHARLES SPENCE BATE was born at Trennick, Truro, on the 16th March, 1818. He was the eldest son of Mr. Charles Bate, who for many years practised as a dentist in Plymouth. He was educated at the Truro Grammar School under the late Dr. Ryall. On leaving school he entered the surgery of Mr. Blewett, where he remained about two years; he then devoted himself to the study and practice of dentistry with his father. After becoming duly qualified, he removed, in 1841, to Swansea, where he soon acquired a considerable practice. While at Swansea he developed an ardent love for Natural History, by his knowledge of which he afterwards became distinguished. He was speedily associated with all the scientific men of the place; and on the occasion of the visit of the British Association to the town in 1848, he took an active part in arranging for the reception of that body, and became one of its members. On more than one occasion subsequently he was President of one of the Sections. He was mainly instrumental in securing the visit

of the British Association to Plymouth in 1877; and as one of the Vice-Presidents at that meeting, he contributed largely by his liberal exercise of hospitality to make the gathering a success.

In 1851 Mr. Spence Bate left Swansea and returned to Plymouth, taking up his residence at 8, Mulgrave Place, where he succeeded to the practice of his father as a dentist, in which profession he was almost unrivalled. He was the author of many works on dentistry, which appeared separately, or in the "*Lancet*," the "*British Journal of Dental Science*," and the "*Medical Gazette*," and in the "*Transactions of the Odontological Society*," to the Presidency of which he was elected in 1855. Two years previously he had been President of the British Dental Association. In 1881 Mr. Spence Bate was a Vice-President of a section of the Medical Congress. He was Honorary Surgeon-Dentist to the Plymouth Dental Dispensary and other local Institutions.

Nor was it only in dentistry that Mr. Spence Bate became celebrated. He devoted a large amount of time to the investigation of the habits of marine animals, and, in conjunction with Mr. I. O. Westwood, was the author of a most important work on the "*British Sessile-eyed Crustacea*." The value of this work was fully recognized by the scientific world, and for this and other Memoirs on the Crustacea, Mr. Bate was elected a Fellow of the Royal Society in 1861. Other works by him on the same subject were a British Museum "*Catalogue of Amphipodous Crustacea*," and a "*Report on the Crustacea Macrura*, collected by H.M.S. '*Challenger*,'" during the cruise of that Vessel round the world. This last-named work was only completed a year ago, and forms a most valuable contribution to carcinological science.

He was keenly interested in all scientific matters connected with the town of Plymouth and county of Devon, and earnestly exerted himself to promote their progress and success. The restoration of the Plymouth Institution to its present healthy activity, after a period of comparative inertness, must be mainly ascribed to him.

Elected a member of the Institution in 1852, he became Secretary 1854-60, President in 1861-62 and 1869-70, and Member of Council 1853-83. He served as Museum Curator at different times, and as Editor of the Transactions in their present form 1869-83. He delivered no fewer than thirty lectures and Presidential Addresses between 1853 and 1882 to this Institution.

Mr. Bate was one of the founders of the Devonshire Association, and during the first year of its existence (1862) was Senior General Secretary. In the following year he vacated this post, having been elected to the office of President of the Association. He delivered his Presidential Address at the Annual Meeting at Plymouth in 1863, and qualified as a permanent member of the Council. He was seldom absent from the annual meetings, and never ceased to take the liveliest interest in the progress of the Association. Between 1862 and 1873 he contributed eleven papers to its Proceedings.

He was an Honorary Member of the Torquay Natural History Society, Honorary Member of the Teign Naturalists' Field Club, and likewise Honorary Member of the Royal Institution, Truro.

Mr. Spence Bate took great interest in Art, and was not only a promoter, but also a working member of the Plymouth Fine Art Society. He also took a warm part in the Plymouth School of Art, and in the carrying out of the new Art, Science and Technical Schools about to be erected as a Jubilee memorial in Plymouth.

Mr. Bate naturally felt a keen interest in the Marine Biological Association, and was very active and energetic in promoting the establishment of their Marine Biological Laboratory recently erected at the Plymouth Citadel.

Some years since he purchased a country residence, called the Rock, at South Brent. There he died, after a brief but painful illness, on Monday, the 29th July, 1889, aged 71 years.

Mr. Bate was twice married. His first wife was Miss Hele, of Ashburton. She died in 1884. His second wife, to whom he was married about two years ago, survives him. He also leaves two sons, one of them, Captain McGuire Bate, of the Royal Engineers; the other, Dr. Hele Bate, of London, who was with his father throughout his last illness; and one daughter, Miss Bate, who has inherited much of her father's artistic taste. The titles of 52 papers by Mr. Spence Bate are given in the Catalogue of Scientific Papers published by the Royal Society, vols. i. and vii. 1867 and 1877.

One of his most valuable researches was published in the Phil. Trans. Roy. Soc. 1858, p. 589–606, on the development of *Carcinus mænas*, but his "Challenger" volume was his last and greatest labour.

The loss of one possessed of such varied and brilliant talents cannot fail to be both widely and severely felt amongst men of science generally and by a large circle of friends by whom he was greatly and justly esteemed.

#### MISCELLANEOUS.

##### THE ISLAND OF PAROS, IN THE CYCLADES, AND ITS MARBLE QUARRIES.<sup>1</sup>

The Island of Paros is eleven miles long and eight miles broad at its widest part. There is a broad belt of nearly level land round the coast; but the interior is mountainous, rising to a height of 2530 feet at Mount St. Elias (probably the ancient Mount Marpeusus).

The northern and western parts consist of schist and gneiss, granite appearing also in the environs of Parekhia. The southern part of the island consists chiefly of crystalline limestone. There is no evidence here of the age of this limestone; but that of Attica is now known to be Cretaceous, and probably that of the Cyclades is of the same age. The finest statuary marble, or *lychnitis*, varies from five to fifteen feet in thickness at the quarries of St. Minas; it occurs in a bed of coarse-grained white marble, with bluish black veins. The coarse marble becomes dark in colour near the *lychnitis*, both above and below it, and thus the layer of statuary marble is distinctly marked off. The dark colour is due to traces of binoxide of manganese and magnetic oxide of iron. It seems probable that the impurities have been withdrawn from the *lychnitis* and have become concentrated near the edges of the adjacent seams of limestone.

The rocks are much disturbed and folded, and often dip at right angles. The ancients avoided the marble lying near the axis of elevation, that being of less good quality than in other parts. A Greek company formed a few years back to work the marble attacked it here, where it could be got at least expense; this discredited the marble in the market, and the company failed, having spent over £160,000 in a railway, landing-pier, and elaborate installation of various kinds.

There is a good deal of excellent coloured marble in the island; but, not having been used by the ancient Greeks, this is little known. ROBERT SWAN, F.C.S.

<sup>1</sup> From British Association Reports, Section C. (Geology), Newcastle Meeting, Sept. 1889.