

the small grains of pyrolusite and the type of false-bedding being quite characteristic of desert conditions. The only footprints got in the Annan Sandstones, also, are similar to those of the Trias, while those of the Dumfries Beds belong to Permian reptiles.

Mr. Peter Macnair read a paper on "The Hurlet Sequence in North Lanarkshire". He described the succession of strata in the East Kilbride, Carluke, and Strathaven districts, and pointed out that they could be correlated bed by bed with those of the Glasgow basin, with the possible exception of the Hurlet Limestone. He pointed out that the Hurlet Limestone was not so constant as was supposed, and that the Blackbyre ought really to be taken as the datum-line. His co-relation with adjacent areas depended upon the occurrence of the large form of *Productus giganteus* in the Blackbyre, the *Posidonomya corrugata* bed above the Hosie, and the Nielson shell bed above the Blackhall Limestone. He dealt particularly with the section seen at Thorntonhall, and said that he had recently found two Neilson shell beds there.

III.—ZOOLOGICAL SOCIETY OF LONDON.

March 23, 1915.—R. H. Burne, Esq., M.A., Vice-President, in the Chair.

Mr. R. Lydekker, F.R.S., F.Z.S.,¹ presented a paper entitled "The True Coracoid", in which he stated that the element in birds and post-Triassic reptiles universally known as the coracoid is the homologue of the human coracoid process, and its equivalent the true coracoid of the monotremes and mammal-like reptiles.

CORRESPONDENCE.

CONCERNING 'LATERITE'.

SIR,—The discussion on laterite that arose from a letter of mine published some years² ago led to the appearance of a number of very interesting papers in the pages of this Magazine, the latest being Dr. Fermor's account of Professor Lacroix' work in French Guinea. My own views on laterite were, I think, made sufficiently clear in the discussion referred to, and I would not trouble you further were it not for a point connected with Dr. Fermor's last paper.

I have been engaged in the study of tropical weathering products for some time and find that one of the difficulties is to *prove*, when dealing with very fine-grained products, the presence of aluminium hydrates mixed with hydrous aluminium silicate. On p. 127 of the current volume of the Magazine Dr. Fermor mentions Mr. Edward's paper in *Economic Geology* (ix, pp. 112–21, 1914) on the occurrence of aluminium hydrates in clays, and after saying that the author examined a large series of *analyses of clays*, adds: "The percentage of bauxite thus detected in these clays." But no bauxite was detected. What Mr. Edwards did was to assume that even if

¹ This was the last paper communicated by the author, who died on April 16, 1915. See Obituary, GEOLOGICAL MAGAZINE, May, p. 238.

² Dated July 4, 1909 (see GEOL. MAG., 1909, p. 431).

a mixture of hydrous silicates of alumina were present in a clay, the resultant composition would be that of kaolinite, and to recalculate as bauxite from a number of analyses, with the help of a mineralogical slide-rule, the excess of alumina over that required for kaolinite. The objections to this procedure were so clear that I was surprised to read Professor Ries' detailed criticism in the June number of the same periodical.

Whatever one may think about laterite, whether the setting property is an essential characteristic or not, whether the word would exist but for that property or not, it is now clear that under the heading 'laterite' petrologists have taken up the study of hydrates of alumina as weathering products. I think the relationship is unfortunate, as may have been gathered previously, and that the main objection to Dr. Fermor's classification of laterites and clays (*Geol. Mag.*, 1911, p. 514), apart from the two new terms, is the necessity of long and difficult chemical analyses in place of determining the 'setting' property of laterite or plasticity of clay.

I need not dwell on the dangers of mineral recalculations in very fine-grained rocks where attempts at identification of component minerals only reach what a distinguished petrologist, under whom I once worked, called 'pious opinions', nor need I recall the dangers of assuming clays to be composed of kaolin. Mr. Hutchings' work in the 1894 volume of this Magazine will be remembered by most of those interested in the subject, and Professor Ries deals with the matter in his *Clays, their Occurrence, Properties, and Uses* (pp. 40 et seq.). In dealing with weathering products recalculation from a total analysis will not do, and the best method I have arrived at yet is fractional treatment with acids and alkali solution. The idea is simple. Alumina may be present in a weathering product as silicate or hydrate, or perhaps as colloid alumina, in a soluble form (kaolinite yields to prolonged acid treatment). If it is there as a silicate, gelatinous silica will be liberated and perhaps go partly into solution. Experiment with silica derived from powdered wollastonite by acid treatment shows that a rapid wash with hot 10 per cent KHO (say for 15 seconds) should take up all liberated silica without attacking other minerals in the rock to a serious extent. If no silica, or very little, is found in the KHO solution or the acid solution, then it is a fair presumption that the alumina dissolved was not there as a silicate or that there is only a slight admixture of silicate. Successive acid attacks should give approximately the amount of soluble hydrate (or colloid alumina) present. Will anyone tell me of a better method for mixtures of hydrous silicates and hydrates where only chemical analysis can be employed?

My impression so far is that aluminium hydrates are formed here in small quantities wherever aluminium silicates exist, and that kaolinite is decomposed to a certain extent. I have examined kaolinized felspar crystals in this connexion, the kaolin being a product of weathering, and believe them to contain some hydrate. One chemist confirms my results. Another contradicts them.

A point of some interest to me has cropped up lately in connexion with the discussion about laterite in this Magazine. Dr. Evans said

that to the best of his recollection he never heard the term laterite applied by engineers in Southern India to anything but the weathering products characterized by aluminium hydrates, etc. Last year a geologist visited me who had spent some years in India. As we were motoring one day he asked me what rock a certain road-metal was. "That," I said, "is what we venture to call laterite." "But," he replied, after examining it, "it is almost identical with the Indian laterite I know." So perhaps we are not such sinners in Malaya after all.

J. B. SCRIVENOR.

BATU GAJAH,
FEDERATED MALAY STATES.
April 15, 1915.

OBITUARY.

FORTESCUE WILLIAM MILLETT.

BORN 1833.

DIED FEBRUARY 8, 1915.

MR. F. W. MILLETT, chiefly known to geologists for his work on the Foraminifera of the St. Erth Clays, was a man of few friends, in whom he confided as an active worker on the more recent forms. His main results were a series of papers on the Foraminifera of the Malay Archipelago (*Journ. Roy. Micro. Soc.*, 1898-1905) and on the Galway shores in conjunction with Mr. F. P. Balkwill (*Journ. Micro. & Nat. Sci.*, iii, 1884). Millett was a great linguist, was deeply versed in the West of England dialects, and was a remarkably well-informed man. But he was a recluse, made few friends beyond his local circle, and was but rarely seen in London of late years. He had a wide and thorough knowledge of his special subject and its literature, but publication was a labour, and much of the work he did died with him. He was 82.

C. D. S.

MISCELLANEOUS.

VALUABLE ADDITION TO THE HULL MUSEUM.—Mr. C. S. Middlemiss, F.G.S., Superintendent of the Geological Survey of India, who was a native of Hull and many years ago spent much time in investigating the geology of East Yorkshire, has made a valuable addition to the geological section of the Hull Museum. He has presented his entire collection, the specimens being all carefully labelled and catalogued, and most of them refer to East Yorkshire. Some years ago Mr. Middlemiss had an opportunity of examining the interesting sections in the Kellaways Rock at South Cave, which were made during the construction of the Hull and Barnsley Railway, and were described in the *GEOLOGICAL MAGAZINE*¹ at the time. The South Cave specimens, together with many others from the red and white Chalk, etc., are included, and in addition there is a valuable series of rocks, with a catalogue giving full localities, etc. Mr. Middlemiss's collection will be of great service to local geologists.

¹ See Walter Keeping and C. S. Middlemiss, "Railway Sections at Cave, Yorkshire": *GEOL. MAG.*, 1883, pp. 215-21.