

agreed that, although nepheline cannot possibly be determined in any of the author's micro-sections, yet the general resemblance of the latter to those of the felspathoid-bearing basalts of the St. Monans and Elie district is so remarkably close as probably to place beyond question their related origin.

When discussing the geological age of the Rock and Spindle vent, the author said he was inclined until recently to concur with Sir A. Geikie in placing it along with other East Fife necks in Permian or, at all events, in post-Carboniferous time. Revision of this opinion would, however, now appear necessary. A careful examination of the Spindle basalt reveals the exceptionally interesting fact that there are enclosed in it, apparently directly, numerous fish teeth in a condition of excellent preservation. Dr. Peach believes he has identified *Megalichthys* and *Psammodus* in the specimens collected. Should these fossils, on fuller investigation, prove not to be derived, then the vent must be carried back in age to the period of the Carboniferous Limestone.

#### CORRESPONDENCE.

##### SALT-WEATHERING AND SUPPOSED WORM-BORINGS IN AUSTRALIA.

SIR,—The interesting notice, signed W. H. W., of Mr. E. J. Dunn's "Geological Notes, Northern Territory, Australia" (*GEOL. MAG.*, March, 1917, p. 134), led me to communicate with Mr. Dunn, who has kindly sent me copies of his recent papers, on which I venture to offer the following remarks.

The appearance of contortion observed on the surface of a two-inch core in presumed Carboniferous rocks, and interpreted by Dr. Jensen and Mr. Dunn himself as due to the borings of worms, reminds one rather of some pieces of the Cotham Stone or Landscape Marble (see Horace B. Woodward, *GEOL. MAG.*, March, 1892, p. 110). The rock before its disturbance appears to have consisted of thin layers of sand alternating with thin layers of black shale. The latter, being carbonaceous, may well have contained in places a considerable amount of decaying organic matter. Consequently the explanation of these disturbances may be the same as that put forward by Mr. Beeby Thomson for the Cotham Marble (August, 1894, *Quart. Journ. Geol. Soc.*, vol. 1, pp. 393-410). That is to say, bubbles of gas springing from the decomposing carbonaceous matter pass through the overlying laminæ and throw them into confusion. When the streams of bubbles are concentrated in definite places naturally a tubular form is assumed; hence the resemblance to worm-borings.

Here one may recall the somewhat similar explanation which Professor A. G. Högbom has given of the Scolithus sandstone and the Pipe-rock (1915, *Bull. Geol. Inst. Upsala*, vol. xiii, pp. 45-60). And it is perhaps appropriate to mention here that in 1911 Mr. W. H. Twelvetrees, Government Geologist of Tasmania, sent to the Natural History Museum two specimens of "pipe-stem sandstone" of supposed annelid origin, but showing in thin section no structure other than grains of sand. "For the most part," said Mr. Twelvetrees, "the tubes are vertical to the bedding, but occasionally we

find them parallel to it. Sometimes they are as thick as a pencil. Sometimes they are trumpet-shaped. At one time we thought they were restricted to one geological horizon, but they evidently persist from our Cambrian or Cambro-Ordovician conglomerate, in which they occur sparsely, through the sandstone of doubtful Cambrian or Ordovician age to Silurian sandstone, in which they are also rare." The specimens are now in the Geological Department, registered A 1658.

In a reply to Mr. Twelvetrees, dated September 30, 1911, I compared the specimens with similar structures in the Cambrian sandstones of this country and of Sweden, in particular with a specimen obtained by me at Bergquara in Småland (Brit. Mus., Geol. Dept., A 1356), where such appearances are fairly common and have been referred to *Scolithus linearis*, Hall. Descriptions of these are given by N. O. Holst (1893, *Sveriges Geol. Undersökning*, ser. C, No. 130, p. 6) and Nathorst (1892, *Sveriges Geologi*, p. 117 and text-figures on p. 118). Though usually interpreted as the filled burrows of worms, Nathorst questions whether the structure has not rather arisen in a mechanical way. The cylinders are often packed so closely that I too was "inclined to regard the structure as due to some mechanical agency". Some American specimens in the British Museum, labelled *Scolithus*, do indicate the existence of burrows subsequently filled; but in the pipe-rock there is no evidence of this. I do not, however, understand how the tubes can ever be parallel to the bedding, as stated by Mr. Twelvetrees, if formed by ascending bubbles.

In another note (Proc. Roy. Soc. Victoria, n.s., vol. x, pp. 209–10) which Mr. Dunn published in May, 1898, he was tempted to ascribe numerous perforations in a decomposed steatitic rock near Coolgardie to worms, larvæ, or flies. He mentions, however, that the roots of eucalyptus trees follow these perforations to as great a depth as 150 feet from the surface. May it not be the case that the perforations were actually made by the eucalyptus roots? Such an action is by no means uncommon.

The weathering action of salt-solution through repeated wettings and dryings is one that I have attempted to apply in removing the matrix from the surface of fossils, or inducing differential weathering of a fossiliferous limestone with impure matrix. The mechanical principle of crystallization involved in the weathering is, as Mr. Dunn says, an intensification of the principle of repeated freezing and thawing in winter, and is more convenient for the palæontologist. The same effect may be attained by the use of the more readily crystallizing salt, sulphate of magnesia (Epsom salts). It is, however, a question whether there may not be in the case of sodium chloride some chemical action as well. Here reference may be made to the paper read by Professor R. C. Wallace at the Manchester Meeting of the British Association, 1915, "On the Corrosive Action of certain Brines in Manitoba." The third paragraph of the Abstract (published in the Association Report, p. 427, and in the *Geol. Mag.*, Jan. 1916, p. 31) indicates a considerable chemical action, due to the fact that a persistent film of concentrated sodium

chloride acts in conjunction with the gases of the atmosphere. The evidence for all this is presumably given in Professor Wallace's complete paper, but I do not know whether that has yet been published. In the case of Mr. Dunn's pebbles, instead of a persistent film there is regular alternation of wet and dry, so that the chemical action, if any, must be considerably less than the mechanical; mere attrition appears to be excluded.

F. A. BATHER.

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OBITUARY.

FRANCOIS CYRILLE GRAND'EURY.

BORN MARCH 9, 1839.

DIED JULY 22, 1917.

By the death of M. Grand'Eury palæobotany loses one of its most distinguished and energetic pioneers. As a mining engineer who spent his life in coal-fields, he had unrivalled opportunities for observing Carboniferous plants in situ, and he always made the most of every discovery which came under his notice. His special studies enabled him to correlate various roots, stems, foliage, and fruits which as isolated fossils had received separate names. He also made many important observations bearing on the origin of coal. His well-known memoir on the Carboniferous Flora of the Loire was published by the Paris Academy of Sciences so long ago as 1876. His great work on the Coal Basin of the Gard appeared in 1890. Numerous other publications culminated in his *Recherches géobotaniques*, which were in course of issue at the time of his death.

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PROFESSOR EDWARD HULL,

M.A., LL.D., F.R.S., late Director Geological Survey of Ireland, and Professor of Geology Royal College of Science, Dublin.

BORN MAY 21, 1829.

DIED OCTOBER 18, 1917.

WE regret to record the death of Professor Hull, at his residence, 14 Stanley Gardens, Notting Hill, W. 11, on October 18, aged 88.

A memorial service was held on Monday, October 22, at St. Peter's Church, Kensington Park Road, Notting Hill, and was attended by numerous representative scientific men.

A record of his life-work as a geologist will appear in December.

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GEORGE C. CRICK,

Assoc. R.S.M., F.G.S., of the Geological Department, British Museum (Natural History).

BORN OCTOBER 9, 1856.

DIED OCTOBER 18, 1917.

WITH sorrow we record the death at his residence, 20 Bernard Gardens, Wimbledon, in his 62nd year, of our former colleague, Mr. George C. Crick, well known as an authority on the fossil Cephalopoda, and author of numerous papers in this Magazine, the Proceedings of the Malacological Society, and the Quarterly Journal of the Geological Society.

A notice of Mr. Crick's scientific work will appear next month.

H. W.