

that the excursionists were unable to sit down to the dinner, to which they had been invited by the President at the Alexandra Hotel, until nearly half-past five, at which hour they ought to have been on their return journey. In consequence of the hurry the party were not able to do justice to the magnificent repast which had been prepared. The usual loyal toasts were obliged to be dispensed with, but the President said he could not let the opportunity pass without proposing the health of the Vicar of Bridlington, who had joined the excursionists and kindly acted as *Cicerone*. In proposing the toast, Mr. Wood mentioned the fact that the Rev. gentleman had earned a title to the gratitude of all naturalists from his exertions in originating and forwarding the measure, which had now become law, for the protection of sea-fowl. In returning thanks, the Rev. H. Barnes said that although he had taken great interest in the question, the thanks of the nation were equally due to his friend Mr. Harland. Mr. Armstrong, of Richmond, proposed the health of Mr. Wood, the President, and eulogised his exertions on behalf of the Naturalists' Club. The President replied in a few words, and the party then hurried off to the station to catch the train for Scarborough at six o'clock, when it was found that the station master had sent off the carriages without any occupants to Scarborough. In consequence of this the whole party were detained at Bridlington until eight o'clock, when they proceeded to Scarborough, from whence a special train was engaged by the President to take them to York, to meet the fast train for the north at 10.25. The party arrived safely in Richmond at midnight.

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### CORRESPONDENCE.

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#### MR. DAVID FORBES'S LECTURE ON VOLCANOS.

SIR.—The able lecture of Mr. D. Forbes, on Volcanos, delivered in St. George's Hall, on the 19th June last, and printed in your July Number, contains views so nearly identical with my own upon this interesting branch of Geology, that I may be allowed, perhaps, without apparent presumption, to mention a very few points on which I am inclined to differ from the lecturer.

1. In his description of a volcanic eruption, p. 318, line 1, he ascribes the formation of the "Volcanic ash or dust," (which may be estimated to compose at least a moiety of the products of every considerable eruption, being carried away by winds, and spread often in layers of some depth, over enormous areas of sea and land) to "the *instantaneous* reduction to an almost impalpable powder" of liquid lava ejected by the gaseous explosions which constitute one of the main features of an eruption. Now my observations on the Vesuvian eruption of 1822 convinced me that the jets of lava thrown up by the great bursting bubbles of steam (or steam mixed with various gases) that rise with vast force in a continuous stream from within the molten matter exposed in the vent, consist for the most part of tattered and jagged fragments—scoriæ in fact, torn from the liquid surface, and cooling as they ascend in the air—some of

them shot up as still liquid drops, and therefore taking the form of "bombs" as they descend; but that these fragments are at first of some considerable size, and only become reduced to the comminution even of the ordinary "puzzolana," in which the grains vary from the size of a nut to that of sea-sand, and ultimately of "impalpable powder or dust," through the effect of their trituration *inter se* in the air during the process of repeated falls into, and rejection from, the crater. In proof of this I would adduce the fact, that not only were the fragmentary ejections from the Volcano in the earlier period of the eruption I have named visibly composed for the most part of coarse materials, but that day by day as the explosive bursts from the crater continued, the matter they projected and which fell from the air on the surrounding country, became finer and more pulverulent, until at length towards the close of the eruption after 20 days duration, it consisted solely of a powder so impalpable, that its distinct particles were undiscoverable by aid of the strongest lens I possessed, and which in virtue of this tenuity penetrated the closest apartments in Naples, wherever air could permeate, and lay thick upon the tables and furniture, even where all apertures were carefully closed.

2. Again, in p. 323, when describing the effects of a submarine eruption, Mr. Forbes says "the molten lava coming in contact with the water, is *at once* broken up into fragments, coarser or finer in proportion to the greater or less cooling power of the water in immediate contact with them, and often in great part *instantly* converted into fine mud . . . beds of which, spread out by the action of the sea, often enclose shells &c." Now what authority is there for this assertion that the contact of water with molten lava at the bottom of the sea instantly converts it into mud? It is very difficult, not to say impossible, to do more than guess at the effect produced on a body of lava expelled from a volcanic vent beneath water. But I am strongly inclined to believe that the reduction into coarse ash or fine mud of its superficial portions—for certainly the great bulk of submarine lavas have flowed upon the sea-bottom much in the same way as on dry land, spreading over the lower levels according to the ordinary laws of gravity effecting liquids—has been the result of continued trituration under the influence of the disturbed water, and not of any "instantaneous" division into powder by the sudden contact of sea-water. If we are to speculate on the probable effects of a submarine eruption (and we have naturally not many facts to guide us in this matter), it would seem most likely that any outbursts of steam which may take place from an exposed surface of lava, in such a position, would, if the depth of water above it were considerable—say 100 feet or more—be condensed long before they could reach the upper air. But these bursts may very probably drive upwards scorix and ash, that is tattered fragments of lava torn from its surface, just as when the eruption is sub-aërial. Such a jet of fragmentary lava would scarcely rise above the sea-level until the apex of the submarine volcano had been raised by the accumulation of ejected matter to within so short a distance of the surface as to permit the bursts of steam, *uncondensed*, together with the fragmentary matters they drive

up, to reach the open air. In either case the disturbance of the sea-water—whether at great depths through the repeated outburst and immediate condensation of huge bubbles of steam, or by the additional action of the waves when the mouth of the volcano had risen high enough to be affected by them—would amply account for the trituration of the fragmentary lava into the materials of ash or mud, as well as its spreading over large contiguous areas.

Thus, whether in the case of sub-aërial or subaqueous volcanic eruptions, I see no reason for attributing the fine division of the mineral matter which composes the fragmentary lava-rocks, commonly called volcanic ash, tuff, peperino, or puzzolana, to any sudden or instantaneous process, but to simple mechanical trituration, or the rubbing against each other of a crowd of coarse particles, forcibly set in motion, whether in the air or water.

Since, as I before observed, such fragmentary matter constitutes at least one moiety of all volcanic formations, of whatever age, the question of its mode of production is not unimportant.

3. With respect to the controversy as to the causes which have shaped out the terrestrial surfaces of the globe, I need only refer to the short paper which appeared in your number for June, 1866 (*Geol. Mag.*, Vol. III., p. 241), to prove my entire accordance with the argument of Mr. Forbes (p. 327), that “the most prominent part in the determination of the external features of the earth” must be assigned “to its internal agencies,” to which alone is owing the occasional elevation of great masses of land up to and often far above the sea-level, and their consequent exposure to the sculpturing and denuding influences as well of ocean waves and currents, as of the meteoric sub-aërial forces—rain, rivers, frost, glaciers, etc.<sup>1</sup>

4. The only other remark I wish to make on Mr. Forbes’s lecture has reference to the mode in which he, as others have done before him, employs the word “Cataclysm,” or “Cataclysmic,” as involving an idea opposed to, or inconsistent with, that of “Uniformity” (p. 327, line 21).

I understand by a “Cataclysm” exactly what in my work on *Volcanos* I have preferred to call a “Paroxysm,” i.e., a more than ordinary violent event in the physical history of the globe, as for example, an extraordinary earthquake, volcanic eruption, or flood, such as occurs perhaps but once in a century or even in a thousand years, but which is still perfectly consistent with the general uniformity of the terrestrial and cosmical agencies. The theory which

<sup>1</sup> I observe that Colonel Greenwood, in your last number (p. 395), ridicules the phrase “meteoric,” as applied to the sub-aërial denuding agencies, instead of “rain and rivers.” But can he not see that his favourite formula leaves out the influences of alternate frost and thaw, of snow and ice, of electricity, chemical decomposition, etc., all more or less effective in wearing away the exposed surfaces of land? The Colonel seems, too, to claim for himself the origination of what he calls “the rain and river theory of erosion.” Now, without denying the “originality” of much in Colonel Greenwood’s volume, yet its first edition was printed only in 1857, and geologists are well aware that through half a century before that date the doctrine of the enormous influence of atmospheric agencies (rain and rivers inclusive) in moulding the surface of the earth had been earnestly advanced by Hutton, Playfair, Lyell, myself, and others. (See *Quarterly Review* for June, 1827, p. 477.)

is really inconsistent with that of Uniformity is what Professor Huxley calls Evolutionism, and which I prefer to call Progression or Progressive Development. Even Mr. Huxley has, it seems to me, abused the similar word "Catastrophical" by taking it to indicate a "tertium quid," a theory as much opposed to Evolutionism as to Uniformitarianism.<sup>1</sup> Whereas I conceive the idea of occasional Catastrophes or Paroxysms to be quite compatible with either theory.—Your obedient servant,

FAIRLAWN, COBHAM, SURREY.

G. POULETT SCROPE.

#### DISCOVERY OF FLINT-IMPLEMENTS NEAR FOLKESTONE, KENT.

SIR,—It may both interest some of your readers as well as stir up those dwelling in the neighbourhood to know that during the course of the last month, I found at Folkestone several Flint-implements. Along the sides of the footpath on the top of the cliff between Folkestone and Sandown, there is a low embankment, made probably of material collected off the adjoining fields; in this embankment the implements occur. They are mostly of the rude flake or "scraper" pattern. The first discovered, which was also the finest, was lying partly exposed on the top of the bank, and subsequently my brother and myself found several more not far from the same spot. I enclose sketches of the principal ones, and I have little doubt that further search in the same bank would bring many others, and possibly finer ones, to light.—I am, etc.,

ST. THOMAS'S RECTORY, BRAMPTON,  
CHESTERFIELD, Aug. 16, 1870.

J. M. MELLO, M.A., F.G.S.

[NOTE.—The locality referred to by the Rev. J. M. Mello is one of great interest and has been, we believe, already noticed by Mr. John Evans, F.R.S., Sec. Geol. Soc., Mr. W. Whitaker, F.G.S., and other gentlemen; by whom stone-implements have also been obtained thereabouts. A flint-flake, corresponding with the largest found by Mr. Mello, is figured on Plate xxvii. A. of the "*Reliquia Aquitanica*," by Messrs. Lartet and Christy. Figs. 4 and 5 of Mr. Mello's sketch resemble a "Flint piercer" from La Madelaine (Op. cit. woodcut fig. 52, p. 134, Part X) and an "Aul or Graver" (fig 23, p. 130. op. cit.). Both in Kent and Sussex, a large manufactory of flint-implements was undoubtedly carried on in prehistoric times.—EDIT. GEOL. MAG.

#### HALL'S MINERALOGISTS' DIRECTORY.

SIR,—In your notice of Hall's Mineralogists' Directory in the August Number of the GEOLOGICAL MAGAZINE, p. 382, you express a hope that information as to omissions and errors will be liberally responded to by local collectors so that the new edition promised by the author may be more complete and accurate than the present one. Having used Mr. Hall's book for some time I have great pleasure in testifying to its general accuracy, at the same time I venture to offer a few notes on one district (Cornwall) with which I am well acquainted, which, perhaps, may be useful to some of your readers and also to Mr. Hall.

<sup>1</sup> Anniversary Address to Geol. Soc., 1869.