

intra-telluric origin, i.e. concretions of the kimberlitic magmas. They hold the same position to kimberlite as the well-known olivine lumps (*olivinknollen*), which sometimes have the same rounded-off form and smooth surface, to the basalt in which they are inclosed." To this I reply that: (1) I have spent some time in the endeavour to prove that kimberlite is only a fragmental rock,¹ and the occurrence in any peridotite of coarsely crystalline 'concretions' of garnet, diopside, enstatite, etc., would be without precedent. (2) It has yet to be proved that these 'olivinknollen' in basalt are 'concretions,' and I do not envy the man who attempts the task. I have examined scores of them; they are seldom, if ever, really well rounded, and are, I believe, fragments of a peridotite, caught up by the basalt, as happens to pieces of granite, gneiss, sedimentary and other kinds of rock. If the lumps of eclogite are concretions it is strange they should be so easily separable from the enclosing 'kimberlite,' and still more so that the minerals at their surface should so often be cut through exactly as they would be by attrition. In other words, speaking from a wide experience in the field, I am certain that these are as truly boulders as any in the bed of an Alpine torrent. But Professor Beck, apparently not quite satisfied with his 'concretion' hypothesis, goes on to suggest that rounding "may be accounted for by a rotatory abrasion during the eruption in the crater." I have examined the materials of a good many volcanic cones, but never saw such perfect rounding as this, and as I foresaw the possibility of that hypothesis being advanced, was careful to insert a sentence to show that I had both considered and rejected it. Thus I find myself unable to admit either the justice of Professor Beck's criticisms or the reasonableness of his hypothesis. The latter, indeed, suggests to me that its inventor has heard the "mouse squeak" more often than "the lark sing."

III.—DERIVED LIMESTONES.

By Professor W. J. SOLLAS, D.Sc., F.R.S.

MY attention has been directed to the following paragraph, which appears in Mr. H. B. Woodward's monograph on the Jurassic Rocks of Britain, vol. iii, p. 31 (1893). It is as follows:—

"Prof. Sollas has suggested that rivers sometimes bear to the sea considerable quantities of undissolved calcareous matter, derived from the formation through which they flow. This is a matter that requires confirmation, for it is known that carbonate of lime is more readily soluble in fresh-water than in sea-water."

The statement attributed to me was more than a mere suggestion, and as the subject is of some interest it may be as well if I now present the evidence which I had in mind when asserting that the

¹ I do not deny—nay, I expect—that large masses of peridotite (probably also diamantiferous) exist in the crystalline floor, but not 'kimberlite' as defined by Professor Carvill Lewis. A little lower down, Professor Beck seems to admit the 'kimberlite' to be a breccia. If so, how can it be a 'magma,' unless he means that the unbroken material exists somewhere down below, in which case it is not likely to be 'kimberlite,' but some ordinary variety of peridotite.

denudation of a limestone and the transportation of calcareous sediment may be accomplished not only by solution but by the mechanical action of fresh-water.

On examining under a microscope the suspended matter which floats in the river Cam above Cambridge, and which may readily be separated by filtration through a muslin net, the observer who looks upon them for the first time will be surprised to find associated with a number of minute living organisms certain bodies which resemble in the closest manner the coccoliths of the Chalk. The appearance of these is so fresh that it would not be altogether inexcusable blunder to regard them as native to the stream, and though it might be objected that fresh-water coccoliths are things hitherto unheard of, yet an answer to this might be found in the fact that on removing the calcareous part of the organism with dilute acid a soft granular film remains behind, which has not only a very organic appearance, but readily stains with magenta and some other aniline dyes.

On pushing the enquiry further, however, it will be found that the residual film is not affected by such stains as are selective in their effects; those which only react upon protoplasm have no effect upon it. Further, the coccoliths give no signs of life; they cannot be made to grow nor to subdivide by fission.

In the old days when the coprolite pits around Cambridge were being worked it was not uncommon to come across streams of chalky water flowing away from the washing tanks. An examination of this revealed all the forms of coccoliths which were to be found floating in the Cam, but in this case there could be no question as to their origin, they were derived from the chalk marl.

Considering, then, that no independent evidence can be cited for the existence of fresh-water coccoliths, that the minute bodies floating in the Cam present no signs of life, and that the river drains a country largely composed of chalk rocks, from which, as we have proof, coccoliths may be derived, the presumption is altogether in favour of regarding the coccoliths of the Cam as mechanical sediments now in process of being carried to the sea.

I have said that these sediments may be "considerable." A good deal depends on what is meant by considerable, but I think the qualification may be justified by the following example. On visiting the gravel-pits at Barnwell occasional white lenticular beds may be observed intercalated amid the finer sands of the deposit. These are composed of carbonate of lime, and a microscopic examination proves them to consist of minute organisms and débris of organisms, which have been derived from the chalk. Foraminifera, whole and broken, of which *Globigerina* is one of the commoner forms, shell prisms, and coccoliths are obvious. Thus we learn that not only may a river transport calcareous sediment, even when constituted of such minute bodies as coccoliths, just as it might an insoluble clay, but further, that under favourable circumstances it may deposit this material and thus form beds of limestone, which are not immediately but only indirectly of organic origin.

It was partly from observations such as these that I was led to suggest a derivative origin for the calcareous substance of the cornstones of the Old Red Sandstone, and for much of the limestone of the Lower Lias; nor has subsequent reflection led me to abandon this explanation, but rather to extend it. A good deal of the magnesian limestone of the North of England is as false-bedded as a modern beach sand, and occurs under circumstances that would lead us to look for its source rather in the mountain limestone than in its poverty-stricken indigenous fauna. Such derivative calcareous matter would by reason of its finely divided state be in a condition to yield readily to the action of magnesian waters and thus pass into dolomite.

It by no means follows that rivers have been the only agents by which mechanical calcareous deposits have been formed from pre-existent limestones; sea waves may have also played their part, as, indeed, is suggested by my friend Mr. Woodward, who also has arrived at the conclusion "that under certain conditions there may be sedimentary deposits of calcareous mud [derivative] as well as chemical precipitates."

IV.—WOODWARDIAN MUSEUM NOTES: ON THE BRITISH SPECIES OF THE GENUS *CONOCORYPHE*.

By F. R. COWPER REED, M.A., F.G.S.

IN 1877 Dr. Woodward¹ recorded nineteen British species of the genus *Conocoryphe*, of which seven were doubtful. The following is the list of them:—

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|---|-----------------------------------|
| <i>Conocoryphe abdita</i> , Salter. | <i>C. Lyellii</i> , Hicks. |
| <i>C. applanata</i> , Salter. | <i>C. ? olenoides</i> , Salter. |
| <i>C. ? bucephala</i> , Belt. | <i>C. ? simplex</i> , Salter. |
| <i>C. bufo</i> , Hicks. | <i>C. solvensis</i> , Hicks. |
| <i>C. coronata</i> , Barrande. | <i>C. sp.</i> , Salter. |
| <i>C. (Solenopleura) depressa</i> , Salter. | <i>C. ? variolaris</i> , Salter. |
| <i>C. Homfrayi</i> , Salter. | <i>C. ? verisimilis</i> , Salter. |
| <i>C. humerosa</i> , Salter. | <i>C. vesata</i> , Salter. |
| <i>C. invita</i> , Salter. | <i>C. ? Williamsoni</i> , Belt. |
| <i>C. ? longispina</i> , Belt. | |

Professor Etheridge² in 1888 gave the following four additional species:—

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|--|-----------------------------|
| <i>Conocoryphe Malvernus</i> , Phillips. | <i>C. perdita</i> , Hicks. |
| <i>C. monile</i> , Salter. | <i>C. Plantii</i> , Salter. |

Salter³ in 1872 had doubtfully recorded *C. ? ecorne* (Angelin)? from Wales. The latest addition to the list was *C. viola* (H. Woodward) in 1888 from Bethesda.⁴

Since the generic name *Conocoryphe* is now used in a much more restricted manner than formerly, it is desirable that the true position of the above-mentioned species should be determined afresh. The genus *Conocoryphe* is now used⁵ as the type of the family

¹ Catal. Brit. Foss. Crust., pp. 31–33.

² Brit. Pal. Foss., pp. 48, 49, and 406.

³ Catal. Camb. Sil. Foss. Woodw. Mus., p. 12.

⁴ H. Woodward, Q.J.G.S., vol. xlv (1888), p. 74, pl. iv.

⁵ Textbook of Palæontology, by Zittel & Eastman (1900), vol. i, p. 626.