

## CORRESPONDENCE.

FORMBY AND LEASOWE MARINE BEDS, OR THE SO-CALLED  
"CYCLAS CLAY."<sup>1</sup>

SIR,—On referring to the Explanation of Geological Map 90 S.E., I can find no reference to a *Lower Scrobicularia Clay*; on the contrary, the so-called *Lower Cyclas Clay* is stated to underlie the main peat from Rimrose Brook to Birkdale. Nor does Mr. De Rance's paper on the Post-glacial Deposits of Western Lancashire and Cheshire help the matter at all, for the only reference I can find is to a *Lower Scrobicularia Clay* occurring in *Cheshire*—a clay well known before either of us devoted any attention to the subject. These papers, adduced along with others I have not seen, as evidences to the contrary, ignore the existence of any *Lower Scrobicularia Clay* in Lancashire, as much as does Geological Sheet 90 S.E.

This being the case, I submit that it is legitimate to conclude that Mr. De Rance knew nothing of any *Lower Scrobicularia Clay* in West Lancashire at the time he penned the papers quoted above.

But whether Mr. De Rance did or did not at that time recognize the existence of a marine lower clay is a matter of very little importance in comparison with the necessity for accuracy of description on the Geological Survey Sheets. As he still clings to the *Cyclas Clay*, but now adopts the qualification that the *larger portion* of these clays in Lancashire are of freshwater origin, it will be necessary for me to re-state my reasons for considering the deposits in question to be marine.

Before seeing the description of Sheet 90 S.E., I had devoted some time to the Post-glacial geology of the district; and though I had hitherto seen nothing but marine or estuarine clays, I never thought, with such authoritative statements before me as the Map and its description contained, of questioning the existence of large freshwater deposits in the neighbourhood. One of the first steps I took to test the character of the clay was to have a hole about 6 ft. by 3 ft. sunk through the main or superior peat and forest-bed at the Alt mouth, where it is described by Mr. De Rance<sup>1</sup> to rest upon *Lower Cyclas Clay*, and at a depth of 5 ft. 6 in. from the surface came upon a thick bed of *Tellina solidula* and *Cardium edule*.

Again, at Birkdale, when carrying out the main outfall sewer, upwards of a mile long, and penetrating the superior peat throughout its length to the grey clay below, numerous marine shells were found, *but not one freshwater shell*, though strict injunctions were given to the Clerk of the works that all shells found should be preserved. The shells found were *Scrobicularia piperata*, *Turritella communis*, *Cardium edule*, *Tellina solidula*, *Buccinum undatum*, and *Natica monilifera*.

Also at the Brickcroft, near the "Ash Tree Inn," Birkdale, which I frequently examined while the clay was being cast, I found

<sup>1</sup> Explanation of Geological Sheet 90 S.E.

*Scrobicularia* and *Tellina*, both in an intercalated belt of blue silt and in the clay below, but not one freshwater shell.

These are typical instances, for Mr. De Rance states that the peat at Birkdale "rests upon 20 ft. of *Cyclas* Clay."

In a well-sinking at Norris Farm, Hightown, a bed of marine shells was found at a depth of 20 feet.

In a well at Seaforth Station, in the valley of the Rimrose, similar results were obtained.

But being desirous of finally settling the matter, and as Mr. De Rance had kindly suggested an examination and determination of the *Diatomaceæ* in the clay, I subjected many specimens, from widely separated localities, taken at various depths, to a searching microscopic examination, and not only found, as determined by Mr. Frederick Kitton, of Norwich, that the species were all marine, but that a considerable number of species of Foraminifera and other marine forms were also included in the clay.

It hardly will, I think, be considered necessary for me to go on piling evidence upon evidence. Suffice it to say that having, as a civil engineer, unusual facilities for carrying on the examination, I have not the slightest hesitation in declaring the whole (with the possible exception of some superficial beds which I have not seen) to be marine. This conclusion, the result of very great care and trouble, is only what one might *à priori* expect, for the watersheds of the rivers and brooks draining into the 75 square miles of country occupied by the deposits we know to exist, together with others that have been destroyed by encroachment of the sea, are quite insufficient to produce the required effect in any moderate allowance of time. We have only to compare what has been effected since the close of the Glacial period in the filling up of lakes by denudation of moraine matter, to see the utter inadequacy of the causes assigned for the production of such extensive and thick deposits as those that underlie the superior peat-bed in West Lancashire. Is it not therefore probable that Mr. De Rance has been the victim of a hasty examination,—that he has mistaken for fossils the dead shells of *Cyclas cornea* (which lives in the dykes now) thrown out with the clay when the periodical cleansing of the dykes take place? It is unnecessary for me, and there is no space to reply to other questions I had not raised in my letter. I shall, however, be glad to enter upon their discussion when the main point of difference between us has been settled.

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