

small stones than the Upper Clay. No large boulders were observed; but as the Lower Boulder-clay is not exhibited to any considerable depth, it may possibly contain some such boulders.

“The Middle Sands and Gravels consist of sands which frequently by the great increase of rounded pebbles become gravels exactly resembling those at Preston Junction and Wigan in Lancashire, and Gresford, Corwen, and Colwyn in North Wales.

“The Upper Boulder-clay contains comparatively few small stones, but many large boulders, two or three feet in diameter. Many of these are striated, and are composed of a dark greenstone; but some are Criffel and Eskdale granite. These large boulders probably occur at an average distance of twenty yards from each other. A mass of compact gypsum about 4 ft. in diameter was also observed.

“The excavators always worked the Upper Clay with a spade, and the Lower Clay with a pick, in consequence of which the difference between the two clays could be distinguished at a considerable distance, whether the Middle Sands and Gravels were between them or not.”

I may now add that for many months during the progress of the excavation the section was of the clearest possible character. Over an area of many acres, the Upper Boulder-clay had been removed, as well as the underlying Sands and Gravels, leaving the Lower Boulder-clay untouched except where it rose above the general level intended for the bottom of the Docks. In such instances it was directly covered with the Upper Boulder-clay—though the line of separation was invariably clear and distinct. The Middle Sands and Gravels varied continuously, from fine and coarse sand into gravel and pebble beds; and indicate very different conditions of deposition compared to that of the two Boulder-clays. In conclusion I need only remark that this tripartite division of Glacial deposits at Liverpool strengthens similar conclusions in North Wales and Lancashire, and proves their general application over a wide area.

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#### THE GRAPTOLITIC MUDSTONES OF THE LAKE DISTRICT.

SIR,—Mr. C. Lapworth's argument in favour of the Graptolitic Mudstones of the Lake district being Lower Llandovery would be very strong if there was a physical break between them and the overlying formations, but this is not the case. The Mudstones graduate upwards into the pale and purple-coloured slates, which in their turn graduate upwards into the Coniston Flags, and so upwards into the Bannerdale beds. From the base of the Mudstones to the top of the Bannerdales is one conformable series. The disappearance of the Graptolites of the Mudstones is not sudden, they are found in the dark bands interstratified with the pale slates to the very top.

I do not believe there can be an enormous break indicating a long lapse of time without there being some signs of unconformity or overlap; in this case there is none, not even a sharp junction.

KENDAL, 20th Oct., 1876.

W. TALBOT AVELINE.