

especially the British Islands. The absence of Lamellibranchiata in rocks older than the Tertiary was noticed as having special interest in the physical history of the Polar seas in Palæozoic and Mesozoic times. None have ever been detected in these rocks. The authors stated that they had sought also for evidence of Trias and Permian fossils in this and other collections made, but there appeared to be none. They also discussed the question of the deposition and extension of the Lias as represented at Eglinton Island and Spitzbergen. The authors furnished a Table showing the distribution of all the species collected by the expedition from twenty localities.

CORRESPONDENCE.

SAND-WORN PEBBLES IN THE WEALDEN OF SUSSEX.

SIR,—Being at Cuckfield lately, I obtained, by the kindness of Mr. Henry Willett, F.G.S., some of the large pebbles and sub-angular pieces of quartz, quartzite, and lydite from the conglomerate, or pebbly and gritty bone-bed, of the “Upper Tunbridge-Wells Sandstone” in the quarry at Whiteman’s Green, near the town. A glaze-like polish in parts of some of these stones attracted my attention; and, on looking at it with the microscope, I discerned the delicate parallel striæ which *blown sand* produces in polishing rocks and stones exposed to its action.

One of these partially glazed stones from the Cuckfield grit has also the *triangular shape* produced by the persistent action of blown sand, and must have been long exposed to such influence on the strand of the old Neocomian lake or estuary, before it was finally imbedded among the grit and rolled bones. Notices of the conglomerate referred to above are given in Mantell’s “Geology of the South-East of England,” 1833, p. 209, etc., and in the “Memoirs Geol. Survey” (Topley’s Weald), 1875, p. 93, and p. 187, *note*.

YORKTOWN, April 10, 1878.

T. RUPERT JONES.

THE PRESERVATION OF DEPOSITS OF INCOHERENT MATERIALS
UNDER TILL OR BOULDER-CLAY.

SIR,—Mr. S. V. Wood, in his “Reply” (GEOL. MAG. Dec. II. Vol. V. p. 187), complains that I have not put the questions at issue between us so incisively as he could have wished. I am sorry to have so far disappointed my opponent, but it was not my intention to controvert all his theoretical views. If he will look at the title of my short paper, he will see that I confine myself to one point, namely, the preservation of interglacial deposits. Mr. Wood has so frequently denied the possibility of interglacial beds having been overflowed by glacier-ice, and so confidently asserted that my views were self-contradictory, that I thought it worth while to point out that his principal, indeed his only, argument was based upon what he himself tacitly admits is merely a preconceived notion. I am glad to find, however, that in other respects his views approximate to mine more nearly than he seems to be aware. Thus, he tells us first, that he does not deny “that ice erodes more in some places than in others;” secondly, that he believes “some moraine accumu-

lates below ice;" and thirdly, that it may to some extent be true that ice does override incoherent deposits without entirely obliterating them. But he instances the section exposed in the North Suffolk Cliff, where Till rests for a long distance upon a comparatively undisturbed surface of sand, as proving that the former deposit has been laid down in the sea, and as demonstrating the physical impossibility of its having been accumulated under ice. Here, again, Mr. Wood's argument is based as before upon the same preconceived notion. He quietly ignores all the *positive* evidence which has been adduced in proof of the subglacier origin and accumulation of the chalky till of Suffolk, and brings forward not one single jot or tittle of positive evidence in favour of his own view. Yet, surely, if the Till in question were a marine formation, there should be no lack of such evidence. If the chalky boulder-clay were laid down upon the sea-bottom, a wide area in the south-east of England must have been submerged, and that for a considerable time. Where, then, I would ask, are the bedded gravel, sand, and clay—the raised beaches and so forth—with marine organisms, which we might reasonably expect to meet with? Where, in short, are the beds equivalent in origin to the shelly brick-clays, etc., of Scotland, Scandinavia, and Canada? Can it be that the sea-bottom of glacial times, in the East Anglian district, was dredged with clay and peppered with stones and boulders at so rapid a rate as to render marine life impossible!

I quite agree with Professor Young that the question of the origin of Till necessarily precedes that of the preservation of interglacial deposits, and I have before now expressed myself to that effect. In the short paper which has called forth his remarks, the subject of the origin of Till was not taken up for the simple reason that I had already discussed that question at sufficient length elsewhere. I still think that the theory of the subglacier origin and accumulation of Till meets every difficulty, and offers a satisfactory explanation of all the phenomena, and I can only regret that my friend is of a different opinion. The view which he inclines to favour has at the first blush a plausible appearance, but it will not stand a closer examination. I was myself disposed at one time to think that the Till might have been deposited in the sea in front of an ice-sheet. But the explanation completely failed when I came to put it to the proof. The objections to it are well-nigh legion, but only one of these need be mentioned here—not because it is the most cogent, but because it can be stated in very few words. Wide-spread and thick deposits of Till occur on the lee-side of the Sidlaws, the Ochils, and other hill-areas in Central Scotland, and many of the included boulders prove that the Till in question has been forced up and over these hills. Now, if the hills were submerged at the time they received their coverings of Till, where, let me ask, was the ice-sheet?

PERTH, April 20th, 1878.

JAMES GEIKIE.

Erratum.—From Mr. A. Champenowne, F.G.S. In Plate VI. Fig. 2 (of the May Number), the arched dotted line over the group 3 is an error, and should be omitted.