

has been extracted. There are also shafts, and, at some little distance, slag-heaps, where the ores have been smelted. The Buitron deposit is a wedge-shaped mass, nearly cut in two by barren ground in the middle. It slightly narrows in descending. The contents are a nearly uniform grey-green ore of copper pyrites, crossed by bands, varying in the percentage of copper. The ore contains about 48 per cent. of sulphur, from 10 to 20 per cent. of iron, from 1 to 5 per cent. of copper, and some silica in a finely divided condition. It is either sent to England as it is dug out of the mine, or treated by cementation, as it is called—burnt by its own sulphur in the open air, and the burnt ore treated for the copper. The precipitates are also obtained by the usual processes. The lead is also saved, but is inconsiderable. Another process is sometimes used (though not at Buitron), suitable only to ores containing under 2 per cent. of copper, called kernel roasting, whereby the copper is by very slow combustion driven to the centre. The Buitron mass may be classed with the great deposits on the same parallel, the Rio Tinto, the Tharsis, and the San Domingo. These masses of pyrites are from 50 to 1200 fathoms long, and from 3 to 50 fathoms broad between the walls. The mass of mineral in the vein has sunk, owing to the process of oxidation by air and water, leaving the walls standing out above the surface in a most remarkable manner. The wash from the surface of these masses deposits hydrated oxide of iron. The whole range of the deposits, occasionally metalliferous in irregular portions, is upwards of 140 miles, the lode winds a little in a limited band of country running nearly east and west. The mineral is essentially the same, but richest in copper at Buitron, near the disturbed edge or side. The coarse schistose rock is not much metamorphosed, except in certain places near the greenstones. The successions are very thinly bedded. In none of these rocks does there appear to be any true slaty cleavage, though there are occasionally good slate flagstones. The literature of this subject may be found in Mr. Mason's original pamphlet on the Mines of Huelva; in one or two Spanish reports; Mr. J. L. Thomas's pamphlet on the Rio Tinto Mines; and Mr. Green's able description in the Quarterly Journal of Science for October, 1868.—The great commercial importance of these deposits arises from the demand in Great Britain, for these ores for their contained sulphur. They are used at Newcastle and elsewhere in the manufacture of sulphuric acid for artificial manure. The trade is of considerable dimensions, amounting altogether to the raising and exporting, from all the mines, of upwards of 500 tons a day, and for this three railways have been constructed.

CORRESPONDENCE.

"PHOLAS" HOLES IN LIMESTONE.

SIR,—I am unwilling to let the month pass without acknowledging the weight of the Rev. T. G. Bonney's observations (on pp. 483, etc.) on certain notes of mine on some superficial phenomena at

Great Orme's Head, and especially on the identification, as burrows of "Pholas," of certain holes in limestone there and elsewhere. The question of the correctness of this determination is of some importance and of real difficulty; but I believe that fuller discussion will only confirm the reference of these holes to Pholas, or some similar animal, to the exclusion of Helix; and I hope to submit some further illustration of this subject shortly.

In the meantime allow me at once to prevent from lending undue support to my own side of the argument an apparent confirmation of the Pholas theory, which appears in p. 494, at the end of Mr. De Rance's paper. There is an error in the identification with the specimen holes under discussion of the holes in blocks of Carboniferous limestone from the sea beach at Walney Island, "in each of which may be seen the two perfect shell valves of a Pholas." Such a discovery would go far to settle the question. I have, however, with Mr. Bolton's permission, just examined the stones referred to. They are beach boulders of limestone, which, as Mr. Bolton explained to me, were imported from some place in Wales to be burned for hydraulic lime in connexion with certain works at Barrow. The shells are not Pholas, but the common *Saxicava rugosa*, quite recent.

Specimens of recent Pholas holes in limestone are by no means of frequent occurrence. My own series is not yet completely satisfactory; and if any reader of the GEOLOGICAL MAGAZINE knows of a locality where such specimens can be obtained, with living or lately dead *Pholades*, I should be greatly obliged by his indicating it to me.

R. D. DARBISHIRE.

26, GEORGE STREET, MANCHESTER,

SIR,—I think that Mr. Mackintosh must have read my paper, in Vol. VI., p. 483, rather hastily, or he would not have said that I was not "fortunate in meeting with very perfect specimens of lithodorous perforations on the Llandudno Peninsula." Those which I describe on page 487 are called "fine burrows . . . one small, the other about $2\frac{1}{2}$ inches deep, and more than an inch in greatest width." Again, I speak of the burrows found within the crevice as "perfectly smooth, fresh, unweathered . . . all of them completely protected from the weather." Will Mr. Mackintosh explain how *Pholades* could produce holes of this kind, varying from half an inch to an inch in depth, and about an inch in width, on the roof of a horizontal crevice, about an inch wide. With regard to the case, which he quotes in a note, of seventeen land shells being taken from one burrow, I can only say that, having never studied the politics of the "Helical State," I do not know what their laws of division of labour may be. Probably, being easy going animals, they are less actively selfish than those of a higher grade, and do not trouble themselves when it happens that one works and another shares the fruits of his labour. I may add that in the case which Mr. Rofe mentions (Fig. 1 of my plate) there were no signs which would lead me to suppose that any considerable portion of the rock had been removed, so as to expose a vertical section of any burrow,

though of course this might happen. I do not think it had so done in this case.

T. G. BONNEY.

SIR,—To the many explanations offered on Lithodomous Perforations, may I be allowed space to say, that in searching for *facts* in Geology in the Furness district, I met with a bed of slate-coloured clay on the sea-shore, about half way between high and low water. This clay was much bored, and the holes contained *live* Pholades, and apparently at work. Suppose in time this clay becomes embedded and changed into rock, and afterwards by some convulsion of nature is thrown to the surface, may it not be possible for the action of the atmosphere, rains, etc., to not only destroy the remains of the original makers of the holes, but alter the appearance of them, and the holes become useful winter homes for land snails.

I have seen the rocks at Ormeshead and other places in Wales, and more than 20 times those on Birkrigg, but after careful examination, cannot see how the explanations hitherto given fully account for the borings.

SAMUEL SALT.

ULVERSTON, 10th January, 1870.

TERRACES ON INLAND SLOPES.

SIR,—I am glad to see, from the reply of Mr. Mackintosh in your last number, that he no longer ventures to “assert” the marine origin of these terraces, though he still “believes” that the greater number of them are “Sea-worn.” I will, however, suggest to him that even such a modified “opinion,” considering the importance of the theory which it involves as to the very recent emergence of this whole island from beneath the sea, requires an array of facts in its support of which his book does not afford a single specimen.

One word upon my “descent of silt theory,” which Mr. Mackintosh still cannot, in any case it seems, admit; but which I look upon as possessing a real interest to geologists who are speculating on the causes which have modelled the existing surfaces, as showing how large an amount of change the atmospheric forces, coupled with that of gravitation, can produce within a very limited time.

It is clear that Mr. Mackintosh will not yet comprehend that the wash of rain on a plough-disturbed surface *must*, and *does*, carry down by degrees a large amount of silt, or disintegrated soil, to some lower level, where the force of the current sustains a check, and the solid matters are deposited. If he will only look at a recently ploughed slope, after a heavy rain-storm, he will see this process exemplified in an unmistakable manner. He speaks of “ridges artificially formed as boundaries between fields,” as “distinct from the terraces under consideration.” Of course they are so, if he refers to banks of earth raised high above the ground on *both* sides, such as are common in Devonshire and some other counties. The “terraces under consideration” are uniformly flat, or nearly so, on the upper side, and rest on a steep bank fronting the lower side.