by the phenomena described. No mention is made of a theory which would, I think, remove the chief difficulties mentioned. I suggest that the true explanation is deformation *plus* chemical segregation. The author rejects deformation (1) because the minerals are not deformed. But this is not to be expected in a rock which has undergone advanced metamorphism. The author assumes that the minerals are original, whereas the rock may have been transformed, as in the Malvern Hills, where some of the gneisses are entirely composed of secondary minerals, and show no trace of the deformation which was evident enough in an earlier stage of the metamorphism. The author objects (2) that the minerals whose distribution are the chief cause of the foliation are not "such as to have been produced" by earth-movements. I cannot see why. During the reconstruction of the rock the segregation of the carbonates of lime and magnesia may well have been accompanied by the crystallizing out of the accessory lime and magnesia silicates. The hypothesis I have suggested accounts for three facts which appear to have caused considerable perplexity, viz.: (1) the isolated masses of granulite, (2) the lenticular form of some of the granulite masses (one would like to know if any of the limestones are lenticular), and (3) the subordination of the limestone to the silicate rocks. The theory of the origin of limestones by segregation from plutonic rocks during deformation, as in the case of the crystalline limestones of Bodwrog and Porth Trecastell in Anglesey (Report Brit. Assoc., 1887, p. 706), has not yet, I think, received the consideration it deserves.

C. CALLAWAY.

CHELTENHAM.

ON THE OCCURRENCE OF *SCALARIA COMMUNIS* IN THE RAISED BEACH ON THE THATCHER ROCK, AND OF *PECTEN MAXIMUS* AND *VENERUPIS*, SP., AT HOPE'S NOSE.

SIR,—In the year 1888 I published in the Transactions of the Devon Assoc. a list of shells found in the Raised Beach on the Thatcher Rock in Torbay.

In due course I sent a reprint to my friend and colleague the late Mr. D. Pidgeon, F.G.S., which Mr. Pidgeon took the practical and ingenious course of returning to me crowded with copious comments and criticisms. As Mr. Pidgeon took the extreme line of denying the genuineness of the Raised Beaches, and I did not feel disposed to seriously entertain this objection, I laid my friend's notes on one side and forgot all about them.

Last Easter, in looking for a copy of my paper for a friend joining the excursion of the Geologists Association to the Gower Caves, I found Mr. Pidgeon's returned copy. In it I discovered a rather important fact, viz., an additional shell to what I believe is already the record list for any one Raised Beach, viz., *Scalaria communis*. Mr. Pidgeon also added his initials to *Aporrhais pes-pelecani*, a species before certified by Mr. J. T. Marshall. *Scalaria communis* makes the grand total of species from the Thatcher beach 44, a total which made Mr. Pidgeon remonstrate, "there are a great

many too many shells, both species and individuals, for a beach." A curious puzzle, but a beach it nevertheless is.

The late Sir Joseph Prestwich embodied my Thatcher collection in his table of the "Mollusca of the Raised Beaches" (Q.J.G.S., vol. xlviii, p. 300).

Anyone interested in the investigation may be pleased to add three species to Sir J. Prestwich's total of 64,[1] viz., *Scalaria communis*, from the Thatcher, on the authority of Mr. D. Pidgeon, and *Pecten maximus* and *Venerupis*, sp., from the Hope's Nose beach, on the authority of the late Mr. Godwin-Austen.[2] Mr. Godwin-Austen described the *Venerupis* as *decussata*, but as that is not a British shell it was probably *V. irus*.

I hope to publish Mr. Pidgeon's criticisms and to discuss them in the transactions of a provincial society. He was one of the acutest of observers, and his detection of the perfect preservation of the sculpture of the Raised Beach shells was one of the most important observations ever recorded on the subject, and one by no means easy to explain.

A. R. Hunt.

Torquay, *May* 8, 1902.

SUB-OCEANIC RIVER VALLEYS.

Sir,—To those who have given some attention to the above subject the following statement may prove interesting.

In the recent work, "The Scenery of England," by Lord Avebury, F.R.S., I had the gratification on turning over its pages to find sympathetic reference to my investigations into the phenomena presented by the submerged river valleys of the British Islands and Western Europe, but coupled with a caution "that perhaps I had carried the argument further than the facts entirely warranted."

In thanking Lord Avebury for his kindness in presenting me with a copy of his book, I referred to this caution, which I regarded as quite natural, and added that it would give me much pleasure to afford his Lordship an opportunity of examining the Admiralty Charts themselves, in order that he might judge for himself whether I was justified in my conclusions as to the position and depth below the surface of the ocean to which these "drowned river valleys" descend.

Accordingly a day was kindly arranged for the examination of the Charts, which Lord Avebury examined with the greatest and most intelligent care, and at the end he expressed his gratification at the result.

His Lordship is now, I understand, preparing a new edition of "The Scenery of England," and a few days since I had the pleasure of receiving from him a letter in which he says: "After looking at your maps I am omitting the sentence in p. 106 in which I express a cautious doubt" in regard to your conclusions. This candid acceptance of my views may, perhaps, have some weight with those geologists who have opposed my views, but who have not taken

[1] Q.J.G.S., vol. xlviii, p. 301, Prestwich writes 64 species, but the list shows only 63.
[2] Trans. Geol. Soc., vol. vi, p. 442.