

LETTERS TO THE EDITOR.

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"Bread-crust" Volcanic Bombs.

It is easy to identify the writer of the friendly notice of Dr. Tempest Anderson's "Volcanic Studies" (second series) in NATURE of April 18, but, notwithstanding his high authority, I must adhere to my explanation of "bread-crust" bombs (p. 42), viz. that the cracks are results, not of internal expansion, but of contraction. I had the opportunity of studying a large example near the crater of Vulcano, with others of smaller size in the Lipari Islands, and brought away a "hand-specimen," now in the Sedgwick Museum. The former has a compact and rather glassy "rind" about an inch thick, with an interior full of small vesicles. The cracks vary much in size, and the walls of the shallower converge (are rifts, in the strict sense of the term); they appear to be analogous with the cracks in septaria, etc., and I do not see how the formation of numerous vesicles filled with steam is to increase the volume of the "core" within the "rind," for the process is not comparable with one of effervescence. Simple contraction of the crust seems inadequate, since these cracks, so far as I have seen, do not occur in lumps which are homogeneous throughout.

In regard to admitting into the book some photographs which Dr. Anderson had already used as illustrations, I determined to risk the criticism, because I knew them to be those which he preferred; so that if I had excluded them I should have had to select from the less valuable group, and I was anxious to obtain a representative series. T. G. BONNEY.

It is certainly not without diffidence that any British geologist will venture to question Prof. Bonney's interpretations of volcanic phenomena, but in this case he is clearly in opposition not only to received opinion, but also to well-established facts.

A "bread-crust" bomb has a thin, compact rind broken up into polygonal areas separated by cracks. The interior is usually highly vesicular, and even pumiceous. An important point is that the cracks in the crust frequently gape as if they had been opened out, and into them the spongy matter of the interior has sometimes risen up in such a manner as to suggest that expansion has taken place after the crust solidified.

Prof. Lacroix, in his monograph on "La Montagne Pelée" (p. 523), has given an excellent account of them. "The concentric arrangement of these bombs and the structure of their crust, different from that of their interior, must be explained in the following manner. When a portion of the magma at a very high temperature is projected in a pasty condition the surface rapidly cools, expelling the gases which it contains. Thus the glassy crust is formed; this occupies a smaller volume than when molten, and cracks from contraction, but at the same time the centre of the bomb, cooling more slowly beneath the protecting crust, gives off its gases only gradually. As the solidifying glass becomes more viscous these gases occasion the production of vesicles of varying size, which increase the volume of the bomb. By the conflict between the contraction of the periphery and the expansion of the centre, 'lips' are produced, and the fragments of the carapace are dis-

placed as shown in plate xxiii." On p. 522 he explains the term "lips" as signifying open cracks in "bread-crust" bombs, with the edges more or less everted like the leaves of a book.

Prof. Mercalli, in his text-book of vulcanology, one of the best and most recent ("Volcani Attivi," p. 110), gives practically the same explanation, and states that these bombs are sometimes called "bombe gonfiati" (bombs that have swelled). Mercalli does not share Prof. Bonney's unwillingness to admit that the molten material in bombs may effervesce, for he describes "exploding bombs" that are ruptured with violence by the expulsion of the gases in the magma, and cites as authorities Prof. Ricco and Sir William Hamilton.

The name was originally given by Prof. Johnston-Lavis (NATURE, vol. xxxix., p. 110, and Proc. Geol. Assoc., vol. xi., 1890, p. 392). He states that "expansion causes cracking of the hardened crust, and in some cases protrusion through the crust." His explanation refers to the bombs of Vulcano (to which Prof. Bonney's description also refers), and was accepted by Prof. Hobbs (*Zeits. Deut. Geol. Gesell.*, vol. xiv., p. 579) and by Prof. Bergeat ("Die Aeolische Inseln," p. 185), both of whom know the island well, and have made careful study of the petrology of these bombs.

References might be multiplied if that were desirable, but sufficient has been said to prove that among English, French, American, Italian, and German geologists who have had every opportunity of observing the facts, the explanation adopted by the reviewer is generally regarded as the only satisfactory one.

J. S. F.

Recovery of Speech through Excitement.

PUBLIC attention has recently been directed to several remarkable examples of recovery of speech by shell-shocked soldiers as the result of unexpected excitement. Your readers may be interested to learn that a very remarkable instance of the loosening of the tongue occurred several thousand years ago, namely, in the case of the afflicted son of Cræsus, King of Lydia. Cyrus, the Persian, besieged and took Sardis 548 B.C., and Herodotus, writing approximately one hundred years after the event, tells us that "when the town was taken one of the Persians was just going to kill Cræsus, not knowing who he was. Cræsus saw the man coming, but under the pressure of his affliction did not care to avoid the blow, not minding whether or no he died beneath the stroke. Then this son of his, who was voiceless, beholding the Persian as he rushed towards Cræsus, in an agony of his fear and grief burst into speech, and said, 'Man, do not kill Cræsus.' This was the first time that he had ever spoken a word, but afterwards he retained the power of speech for the remainder of his life." (Herodotus, book i., chap. lxxxv., translated by Rawlinson.)

J. NEWTON FRIEND.

London, May 6.

THE PROMOTION OF POST-GRADUATE WORK AND RESEARCH.

THE Senate of the University of London has had under consideration proposals which have emanated from the Conference of Canadian Universities held in May, 1916, the Conference of Universities held on May 18, 1917, and the American Association of University Professors. The object in view is to encourage post-graduate work and research and to contrive some means of strengthening the ties between the universities of Britain and her dependencies and those of the