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## A FURTHER NOTE ON OBSIDIAN BUTTONS.

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THE occurrence in Tasmania of these singular spheroids of jet black obsidian, popularly known as "buttons," was brought under the notice of the Royal Society in 1897, by Messrs. Twelvetrees and Petterd,\* who gave a very full description of the specimens which had come under their observation, and discussed the various theories which have been put forward to account for their origin and distribution. In the same year I contributed a few supplementary remarks on the subject † with special reference to the earliest records of the discovery of these "buttons" in Australia and Tasmania. In 1898, during a journey from Texas, U.S.A., to San Francisco, I had noted the presence of obsidian in lava-flows of Northern Mexico, and had seen some extensive tracts of comparatively recent volcanic rock in Southern California, which suggested the possibility of our obtaining from that source further evidence respecting these singular volcanic products. Shortly after my return to Tasmania, I sent copies of the abovementioned papers to Dr. Joseph LeConte, the well known Professor of Geology in the University of California, in the hope that his intimate knowledge of the geological conditions of the United States might enable him to throw fresh light on this very obscure subject.

The occurrence of obsidian in the peculiar form under consideration does not appear to have been noted in California, but Professor LeConte kindly replied to my

\* On the occurrence of obsidian "buttons" in Tasmania, by W. H. Twelvetrees, F.G.S., and W. F. Petterd, C.M.Z.S. Proc. Royal Society of Tasmania, 1897, p. 39.

† Remarks on obsidian "buttons," by T. Stephens, M.A., F.G.S. Proc. Roy. Soc. of Tasmania, 1897, p. 54.

inquiries, saying that he had consulted Dr. A. C. Lawson, Associate Professor of Geology and Mineralogy, and that their joint suggestion was, that the button-shaped forms described and figured in the paper of Messrs. Twelvetrees and Petterd might possibly be due to the formation of spherulites in a lava with obscure flow-structure, this structure being brought out by weathering; but this suggestion appeared to have been offered with some hesitation in the absence of any opportunity of examination of specimens. The next thing to be done was to attempt to supply specimens for personal examination, and an application to the Trustees of the Tasmanian Museum resulted in my being enabled to forward to San Francisco three obsidian buttons from a collection made many years ago near Glenelg, in Victoria, and presented to the Museum.

By the last mail from America I received a second letter from Professor LeConte, in which he says that, after careful examination of the specimens, he gives up the theory of their possible concretionary origin. His letter continues as follows:—

“I cannot think they have any relation to volcanic bombs: their meteoric origin seems to me out of the question. Professor Lawson throws out the following suggestion:—‘May they not be the result of the bursting of bubbles on the surface of some liquid stiffly-viscous lava, ready to solidify? The bursting of such a bubble would probably leave a mound-like centre surrounded by an elevated ring-like margin, sharply elevated at first, but quickly becoming more rounded by gravity and by cohesive shrinkage, before setting completely. Thus might arise the appearance of the flat side. Subsequently the little ring and mound separate from the lava-mass by conchoidal fracture, forming the hemispherical side. The fracture is supposed to be determined by inequality of surface tension produced by the bursting of the bubble.’

“You see it is a mere suggestion, but I can think of nothing better to offer. As to their mode of occurrence, it is easy to see that their *form* would favour wide distribution by mechanical means, and their *singularity*, by human agency.

“Many thanks for these valuable additions to our Museum.”

The suggestion thus offered by Professor LeConte claims attention as being the nearest approach to a satisfactory solution of a difficult problem that has yet been put forward. It is necessarily conjectural, for the exact conditions attending the bursting of bubbles of interstitial steam or gas near the surface of a rapidly cooling glassy volcanic magma have never been witnessed by any human

eye. The ellipsoidal shape, which is not uncommon in Australian specimens of the buttons, is inconsistent with the theory of a long rotatory flight through the air, for any such volcanic ejectamenta must have cooled too quickly to allow of any change of form on reaching the ground. A similar elongation of originally spheroidal cavities in vesicular basaltic lavas is a familiar instance in this connection.

The general probabilities seem to be in favour of the origin of the obsidian in or near the country in which the "buttons" are found, even if volcanic rocks of the necessary acidic type are not now in evidence: that they have been largely distributed by human agency cannot be doubted. Their reported occurrence in drift gravels in certain localities is still a mystery for the elucidation of which no satisfactory explanation has yet been offered.