LETTERS TO THE EDITOR.

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The Origin of Flint.

THE interesting letter of Sir E. Ray Lankester in NATURE of June 7 induces me to offer a brief account of certain experiments I have been making on this subject.

My interest in the origin of flint was aroused by the many fantastically shaped flints like gnarled roots that one comes across when walking over the Downs. These are of many curious shapes, but an interesting point is that when complete there is often one spot which looks like the gutter of a mould.

This suggests that the silica might have trickled through an opening in the chalk held up in colloidal solution by carbonic acid, and then the carbonic acid, combining with the calcium carbonate of the chalk, formed soluble calcium bicarbonate, thus at the same time enlarging the cavity and producing the conditions for the deposit of the silica, which is no longer held up by the carbonic acid, and is precipitated by the crystalloidal calcium bicarbonate now gone into solution. This view is, moreover, supported by the tabular flints referred to by Sir E. Ray Lankester.

If a very dilute solution of sodium silicate be prepared by diluting ordinary waterglass with about 200 times its volume of water, this may be saturated with carbon dioxide without any precipitation, and the solution can be dialysed, so yielding a colloidal solution of silicic acid in carbonic acid.

When a piece of chalk is dipped in this solution nothing happens immediately, but after twenty-four hours a silicic gel appears on the chalk; in the absence of chalk the silicic acid solution keeps for some weeks before passing from its metastable solution over into a gel.

An attempt was then made to simulate natural flint formation by percolating colloidal silicic acid charged with carbonic acid through chalk.

The chalk used was obtained from the South Downs near Jevington. A cubical block was sawn out about 3 in in the side, a hole was drilled about ¼ in. in width and 2 in. in depth, and then a little chalk was scooped away to leave a shallow pit surrounding the hole. Several times daily this was filled up with the dilute silicic acid solution during a period of more than three months, until there was a solid core of silica in the place of the former hole in the chalk. At first the percolation is rapid, but after about a week becomes slower. The silicic acid jelly first formed is very porous, and takes up water readily. Even when a silicic jelly has hardened until it is as hard as and more brittle than glass, it will go on taking up a remarkable amount of dilute silicic acid into its pores, and giving off air-bubbles with a singing noise.

At the end of the experiment the bulk of the chalk was sawn away, and the part containing the deposited silica placed in dilute hydrochloric acid until nearly all the chalk had been removed, leaving just a thin layer at places to show contrast in colour; there remained a cast of the tube and pit at the top resembling in shape a small toadstool with a concave depressed top.

This was insoluble in acid, dark brown in colour, and semi-translucent. It looked like a flint, especially when wet, when it showed up dark brown and semi-transparent against the small amount of chalk that had been left. The only thing lacking was the extreme hardness of flint, for although harder than the chalk and glassy, it crushed under pressure more readily than flint. It still absorbed water, as do flints, and if there were many years of time to spare, it seemed as if it might be possible by such a process to arrive at true flinty hardness.

The process was tedious, and for some reason which I cannot at present understand did not always succeed; an attempt to feed the growth with a wick of cotton threads failed because of an interesting silicification on the fibres which stopped the flow.

BENJAMIN MOORE.

SIR E. RAY LANKESTER'S difficulties as to the origin of flint (NATURE, vol. xcix., p. 283) would be largely removed if it were more generally recognised that the vast majority of flints in all formations, excluding the occasional examples deposited along fissures, are chemical replacements of the limestones in which they occur. Microscopic observation of thin sections has, of course, furnished the most powerful confirmation of this view. The difficulties as to the cause of such replacement are similar in the case of all "concretions" where the original rock-substance has been removed and new material has been substituted. We now know that even iron pyrites may thus replace silicates or quartz, and that massive crystalline ores need not represent the infilling of cavities.

May I refer to some views which would dissociate flints from any special abundance of siliceous sponges along the horizons at which they occur ("The Rhythmic Deposition of Flint," *Geological Magazine*, 1917, p. 64)? The traces of sponges found in flint seem due to the fact that the deposition of the flint has preserved them, while they have been dissolved away from other zones. The paper above referred to may be regarded as a supplement to the general discussion of work on flints in my "Rocks and their Origins" (1912), pp. 38–42. GRENVILLE A J. COLE.

June 18.

WITH reference to Sir E. Ray Lankester's interesting notes on "The Origin of Flint" in NATURE of June 7, it is worthy of remark that the structure of black flints, referred to as consisting of minute crystals of silica embedded in colloid silica, may indicate the formation of such flints from the gradual crystallisation of silicic acid gels. Many cases of the production of micro-crystals in artificial inorganic and organic gels are known; indeed, these usually break up eventually with the development of such micro- or macro-crystals. The very slow crystallisation of gelatinous silica appears to be due largely to its small diffusion constant and insolubility. S. C. BRADFORD.

The Science Museum, South Kensington,
London, S.W., June 14.

Electric Discharge from Scythe.

ON the afternoon of June 4 I was mowing a heavy crop of grass with the scythe when I noticed a sharp crack occurring during the cutting strokes. The noise did not occur at every stroke, but was sometimes heard three times during a stroke. The noise exactly resembled a high-tension discharge, and I can think of no explanation other than that the blade became charged, due to the friction on the very dry grass. It would be interesting to repeat the experiment in the dark, but I fear the grass would not be sufficiently dry. I may add that I am quite satisfied that the noise did not arise from the snapping of dry stems or from the scythe hitting stones, etc.

I should be interested to hear if any of your readers have had a similar experience. J. R. PANNELL.

Twickenham, Middlesex.