of Tarawera, and two or three miles further south Lake Rotomahana, the spot where the famous Pink and White Terraces existed. Before the recent eruption there were no craters on Mount Tarawera, the form of which was a ridge, apparently due to denudation.

Shortly after midnight on the 10th of June a series of tremendous explosions took place from various parts of the Tarawera ridge, and columns of steam were thrown up with quantities of red-hot stones. The whole mountain appeared as if on fire. A column of steam was then sent up from near Okaro far to the west, and, finally, a great explosion took place in Lake Rotomahana, and steam rushed forth to a height exceeding that of the columns from Tarawera. These eruptions from the plain were not accompanied by any red-hot stones; the ejecta were of much lower temperature. The principal eruption, accompanied by violent earthquakes and loud noises of various kinds, was over by 5·30 A.M., and the mountain craters ceased to be active within twenty-four hours, but steam with some stones and mud continued to issue from the Rotomahana and Okero craters for several days, and steam has ever since been emitted from Rotomahana.

The results of the eruption in the form of fissures on Mount Tarawera, the change of Rotomahana from a lake to a crater of larger dimensions, with precipitous walls, the formation of a new lake between this crater and Tarawera, and the formation of a number of small craters about Okaro, were then briefly noticed. The materials ejected were composed of augite-andesite, and rhyolites, both compact and vesicular. The mineral structure and distribution over the surrounding country of various forms of pumice, scoria, and ash were described, and it was shown that there was a difference in the substances ejected from the mountain craters of Tarawera and those from the craters in the plain at Rotomahana and Okaro, the former comprising pumice and scoria, which were not thrown out from the latter, and but little steam issuing from the higher craters when compared with the enormous volumes emitted from the lower vents. The cause of the eruption was ascribed to the reheating of old lava-streams saturated with water. This reheating was apparently not due to crushing; for, had it been so, the preceding earthquakes would have been more violent, but probably to molten rock coming up from below and heating the rocks near the surface. The eruptions from Rotomahana and Okaro were purely hydrothermal.

## CORRESPONDENCE

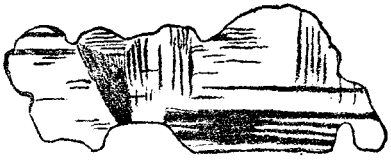
### THE LIZARD SERPENTINES.

SIR,—As Prof. Bonney has called in question my statement that felspar occurs in the Rill serpentine, I should like to mention the grounds on which that statement was based. Of course there is always a certain amount of inference involved in the identification of minerals under the microscope. One recognizes a number of characters, and then one forms the opinion that those characters indicate the presence of a certain mineral.

Now I find in all sections of the Rill serpentine that I have examined irregular grains of a colourless mineral having the refractive index of felspar, so far as one can judge of this by the relief of the section and the character of its surface. This mineral always polarizes in the neutral tints of the first order in sections in which olivine and augite would give as a rule chromatic polarization. It frequently shows, moreover, a fine lamellar twinning, and sometimes two sets of parallel lamellæ may be seen intersecting each other at a high angle. It has been rendered turbid in places by granular decomposition products. Now I know of no mineral except felspar which possesses all these characters. Professor Bonney vaguely suggests that it is augite or diallage. I am, of course, aware that augite does show multiple twinning; but I cannot possibly regard this mineral as augite. In one case in which the extinction of the two sets of twin lamellæ were approximately symmetrical with reference to the trace of the face of composition, the combined angle was 53°. Now, if the crystal were augite, twinned according to the ordinary law, such a section could not possibly be cut approximately at right angles to an optic axis;[1] and, therefore, in slides of the thickness used, could not possibly polarize in the neutral tints of the first order, as it actually does.

Another very important point is the existence of two sets of lamellæ intersecting at a high angle. This is perfectly easy to understand on the assumption that the mineral is felspar; but, so far as I know, inexplicable on the assumption that it is augite.

To sum up. As the mineral possesses the refractive power of felspar, the double-refraction of felspar, the twinning of felspar, and the mode of alteration of felspar, so far as we are able to judge of these characters under the microscope, I adhere most firmly to my original statement.



Section of felspar in the Rill serpentine, showing cross-twinning; Nicols crossed. Magnified 80 diameters.

In my remarks on the Rauenthal serpentine I have simply followed Weigand, and I must leave him to take care of himself, as, no doubt, he is well able to do. I may remark, however, that the main point of Weigand's paper, so far as it relates to the Rauenthal rock, is to prove that serpentine has been largely produced by the alteration of hornblende, and that the serpentine so formed can be distinguished from that produced by the alteration of olivine. The slides of specimens purchased from Sturtz amply

[1] On referring to Fouqué and Lévy (Min. Micrographique, p. 355), it will be seen that the section in question, if of augite, would be out of the zone 100 : 010 and would make an angle of about 35° with the ortho-pinacoid.

confirm Weigand so far as this is concerned. It must be remembered that Weigand's paper appeared in 1875, at a time when the notion that all serpentines were altered olivine-rocks was becoming very general in consequence of the researches of Sandberger and Tschermak, published some eight or nine years previously.

I may take this opportunity of referring to Col. McMahon's paper in the same number of the GEOLOGICAL MAGAZINE. I have no new facts of any importance to add on the subject referred to, and I do not think that any useful purpose would be served by my attempting to remove the objections raised by Col. McMahon. I cannot explain why foliation has been developed in some cases and not in others. The apparently capricious manner in which foliation comes in is equally striking in the Scourie Dyke and in the Lizard gabbros. If I am right in one case, I am right in the other; and if I am wrong in one case, I am wrong in the other. I believe with Col. McMahon that foliation may be produced in connexion with the intrusion of plutonic rocks; but I cannot explain the foliation of the Lizard gabbros in this way.

Col. McMahon quotes Prof. Bonney as saying that the serpentine is "free from all signs of disturbance." This is true of the serpentine locally, as it is of the gabbro; but it is not true generally. There are the same signs of disturbance in the serpentine as there are in the gabbro. I have a polished slab of serpentine from Porthalla, which shows precisely the same structural features as the figured slab of augen-gabbro from Karakclews. Abundant signs of pressure metamorphism occur also in the serpentine near Mullion Cove.

J. J. H. TEALL.

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## BORING AT BLETCHLEY.

SIR,—The London and North-Western Railway Company have for some time been carrying out a trial-boring for water; and if they have not found what they were in search of, they have made a discovery which is interesting to geologists in reference to the underground structure of the central and eastern parts of England. I have not yet the full details before me; but, from the information furnished by Mr. C. Bowen Cooke, it would appear that the boring-rods, after penetrating the Jurassic Clays (called by my informant the "Oxford Clay"), struck on a very hard rock, of which three small specimens were sent to me for identification. On examining them I had no difficulty in giving a reply. The specimens appear to consist of finely-crystalline quartz-felsite, with some green mica, and evidently form a portion of the old Pre-Triassic ridge, which, as all underground borings combine to prove, underlies the Mesozoic formations of this part of England.

I hope ere long to have a complete series of the cores brought up from the boring, and to be able to give fuller details.

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