intrusion of granophyre, on the other hand to the gabbro-magma having enclosed considerable masses of the basic lavas of the district, which are themselves highly metamorphosed.

2. "The Geology of Monte Chaberton." By. A. M. Davies, Esq., B.Sc., F.G.S., and J. W. Gregory, D.Sc., F.G.S.

The importance of the Chaberton district, as affording a key to the general geology of the Cottians, is explained, and the opinions of previous observers referred to. The mountain was examined from three sides—that of the Grand Vallon; the approach from Mont Genèvre by the Col de Chaberton; and that of the Clos des Morts Valley. The following are the conclusions arrived at:—

(1) The well-known Chaberton serpentine is intrusive into the calc-schists, and yields fragments to the *caryneules* of the Trias; it is, therefore, a *pre-Triassic* intrusion.

(2) There are on the mountain other fairly basic schistose rocks (quartz-chlorite-schists) which cut the Trias, and are therefore *post-Triassic.*

(3) The contorted beds in the Clos des Morts Valley are fossiliferous limestone, and it is from them that the fallen blocks previously recorded were derived. The only recognisable fossil is *Calamophyllia fenestrata*, Reuss, a characteristic coral of the Gosau beds. In spite, therefore, of the doubts of Kilian and Diener, the opinion expressed by Neumayr as to the existence of Cretaceous rock in this part of the Alps is confirmed.

(4) The earth-movements of the mountain are described; they include ordinary folds, inversions, faults, and an important thrust-plane.

(5) It is suggested that in addition to the two series of intrusive rocks above-mentioned as pre- and post-Triassic, a third series of late Cretaceous or Tertiary date may be represented in the Mont Genèvre and Rocciavré masses.

3. "Cone in Cone. How it occurs in the Devonian (?) Series in Pennsylvania, U.S.A., with further details of its Structure, Varieties, etc." By W. S. Gresley, Esq., F.G.S.

The author describes cone-in-cone structure occurring in the Portage Shales of Pennsylvania, and gives details concerning the nature of the structure as seen in these shales. He criticizes the explanation of Mr. J. Young as to the origin of the structure, and concurs in a great measure with the views of those who have suggested that the formation was due to pressure acting on concretions.

CORRESPONDENCE.

A PHYSICAL CONTRIBUTION TO DYNAMIC METAMORPHISM.

SIR,—Among recent physical researches, one of the most interesting to geologists is embodied in two papers by Prof. M. Carey Lea on "Endothermic Reactions effected by Mechanical Force."[1] The author shows by direct experiment "that mechanical force can bring about reactions which require expenditure of energy, which energy

[1] Amer. Journ. Sci. 1893 (3), vol. xlvi. pp. 241-244, 413-420.

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is supplied by mechanical force precisely in the same way that light, heat, and electricity supply energy in the endothermic changes which they bring about."

The experiments consisted chiefly in the reduction of silver, mercury, platinum, and gold, from their salts. The result was indicated in each case by a darkening of the powder, and in one case, sodium chloraurate, the reduced gold was separated and weighed.

In a first series of experiments the substance operated upon, wrapped in platinum or silver foil, was subjected to a pressure of about 70,000 atmospheres by means of a specially devised apparatus. More interesting, however, is a second series of experiments, in which similar results were obtained by grinding the powder by hand in a stout porcelain mortar, so as to give a shearing motion. The important conclusions drawn are:

(i.) That in these experiments the mechanical energy does not undergo any intermediate conversion into sensible heat. The operation may be conducted slowly or intermittently, and the apparatus does not become warmed.

(ii.) That shearing stress is enormously more effective than simple pressure.

These two points are well illustrated by the behaviour of mercuric chloride. A simple pressure of 70,000 atmospheres was not sufficient to produce any change, but trituration in a mortar for fifteen minutes caused a very evident reduction to calomel. In this instance the decomposition is one which *cannot be produced by heat.*

Although the chemical transformations involved in dynamic metamorphism are of a more complex kind than those here noted, it seems fair to conclude that, in so far as they are endothermic, they may be brought about by mechanical force only, without the intervention of heat, and that the most marked effects of this kind are to be looked for where shearing stress has been brought into play.

St. John's College, Cambridge. Alfred Harker.

May 4th, 1894.

THE DEVONIAN VOLCANIC ROCKS OF START BAY.

Sir,—In my paper "On Certain Affinities between the Devonian Rocks of South Devon and the Metamorphic Schists" (Geological Magazine, June, 1892), no attempt was made to define the horizon of any of the Devonian rocks themselves. The schists were merely referred to unaltered rocks whose position had been elsewhere declared.

In his recent address to the Geological Society, Mr. W. H. Hudleston, in noticing my paper, remarks that Lower Devonian diabases "in some districts are not by any means in evidence" (Proc. Geol. Soc. vol. 50, p. 130).

As a matter of fact the exact horizon of the Devonian diabases in Start Bay (to which the metamorphic green rocks were referred) does not affect my notes concerning them, which merely go to show that the green rocks at the Start and neighbourhood are of about the same age as the said Start Bay diabases, whether the latter be Lower, Middle, or Upper Devonian.

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