

distance of several feet. Apparently the conditions which allow of the formation of mud-cracks (see fig. 1) also postulate a slight variation in the composition of the limy muds originally deposited. Thus, a series of alternating layers, which have been successively cracked by dessication, when viewed at right angles to their plane of deposition, show a series of stratified brecciated fragments. It is interesting to note that where quarries have been opened in the Bellefonte section (at both the middle Beekmantown and Lowville horizons) so as to expose the limestone beds for some distance along both the dip and strike, great mud-cracked areas have been brought to view. The writer has seen a mud-cracked surface on the west wall of the quarries at Tyrone which was at least one-half an acre in area. Only the closest inspection, however, of the section across or at right angles to the dip will show any structure that might lead the stratigrapher to suppose that mud-cracks were present, and in such great abundance. When the filling of the cracks, or rather, the material surrounding the phenoclasts, is of a different colour or texture from that of the phenoclasts themselves, a stratified intraformational breccia often proclaims that its other name is "mud-crack." Thus, in a region such as that characterized by the Appalachian type of folds, where the rocks are usually observed at an angle of between 25 and 60 degrees, it is quite natural that mud-cracks and ripple-marks should be considered rare phenomena, except where exposed in quarries and road-cuts along the strike. The mud-crack zone may have a stratigraphic thickness of only 3 or 4 feet and yet extend along the strike a distance as great as that from Bellefonte to Tyrone (60 miles), or even farther. What the total area of such a mud-cracked surface might amount to is difficult to surmise. Owing to the fact that the dip of the limestones at Pleasant Gap, several miles east of Bellefonte, is considerably flatter than the dip of the same beds at the latter place, the writer has been unable to get, as yet, any exact data as to the geographical extent of this phenomenon, but all signs point to its being an exceptionally wide one.

In connection with this subject it might be well to mention a certain columnar structure observed and described by E. M. Kindle (5) in the Silurian limestone on Temiscouata Lake, in eastern Quebec. The occurrence of columnar structure in limestone is unusual, and very like basaltic columnar structure in general, "but the columns are perhaps less regular in the number of faces shown, five to seven being a common number."

(To be continued).