tion. The shales are of a dull bluish gray color when fresh, and weather to a light greenish gray. Argillaceous materials predominate, with frequent small grains of quartz and feldspar, while other materials derived from the Algonkian volcanics appear sparingly. The thickness of the Harpers formation is difficult to determine, owing to the absence of any complete section of it. Its outcrops are everywhere included between faults which have cut off intermediate thicknesses. It has been estimated, as the result of a number of measurements, to have a probable thickness of 1200 feet.

The shales have been subjected everywhere to considerable alteration, the feldspathic materials being partially recrystallized into quartz and mica, with the development of schistosity. The metamorphism is much more pronounced along the eastern border, in the Catoctin area, where the change has proceeded so far as to produce a mica-schist in which small quartz lenses are developed between the layers. Decomposition has affected the shale to considerable depths, the argillaceous materials furnishing a sufficient amount of clay to produce a soil of some value, but on steep slopes it is easily washed.

The Antietam Formation.—The Antietam formation receives its name from Antietam creek, along the tributaries of which the deposits of this formation are most typically developed. The rock is a sandstone which grades below by gradual transitions into the Harpers shale. The sandstone is composed of small grains of white quartzite well worn and sorted, and it contains a small percentage of carbonate of lime. Its color is almost invariably of a dull brown. It is more fossiliferous than the other Cambrian formations, remains of trilobites being not uncommon. The formation has a thickness of about 500 feet.

The Antietam sandstone shows little alteration in its typical area, but east of Catoctin Mountain there are some very silicious schists that may possibly represent it. The more calcareous varieties weather readily, but numerous blocks of the sandstone generally strew the surface.

The Shenandoah Formation (lower part).—The Shenandoah formation, so called from the fact that it forms the floor of the