matrix. Such rocks, when fine-grained, can hardly, at first sight or with the unaided eye, be distinguished from some compact igneous rocks, though a microscopic examination at once reveals their fragmental character. In other cases, where the graywacke has been formed mainly out of the débris of granite, quartz-porphyry, or other felspathic masses, the grains consist so largely of felspar, and the paste also is so felspathic, that the rock might be mistaken for some close-grained granular porphyry. Graywacke occurs extensively among the Palæozoic formations, in beds alternating with shales and conglomerates. It represents the muddy sand of some of the Palæozoic sea-floors, retaining often its ripple-marks and sun-cracks. The metamorphism it has undergone has generally not been great, and for the most part is limited to induration, partly by pressure and partly by permeation of a siliceous cement. But where felspathic ingredients prevail, the rock has offered facilities for alteration, and has been here and there changed into highly crystalline mica-schists full of garnets and other secondary minerals (contact-metamorphism at the granite of New Galloway, Scotland, postea, Book IV. Part VIII.).

The more fissile fine-grained varieties of this rock have been termed graywacke-slate (p. 238). In these, as well as in graywacke, organic remains occur among the Silurian and Devonian formations. Sometimes in the Lower Silurian rocks of Scotland, these strata become black with carbonaceous matter, among which vast numbers of graptolites may be observed. Gradations into sandstone are termed G raywacke-sandstone. In Norway the reddish felspathic graywacke or sandstone of the Primordial rocks is called S p a r a g m ite; similar material forms much of the Torridon sandstone of Scotland.

Quartzite.—An altered siliceous sandstone (see p. 311).

## 2. Clay Rocks (Pelites)

These are composed of fine argillaceous sediment or mud, derived from the waste of rocks. Perfectly pure clay or kaolin, hydrated silicate of alumina, may be obtained where granites and other felspar-bearing rocks decompose. But, as a rule, the argillaceous materials are mixed with various impurities.

Clay, Mud.—The decomposition of felspars and allied minerals gives rise to the formation of hydrous aluminous silicates, which, occurring usually in a state of fine subdivi-