

la Beche expressed himself, even earlier, in the same manner as Riviere, and doubted whether the metamorphic theory (the sweeping hypothesis, as he called it) was admissible in such cases, although he quite acknowledges it within its proper limits (Report on the Geology of Cornwall, p. 34). With this, A. Erdmann, a high authority with regard to the Swedish primitive rocks, and Von Blöde, who has explored Finland in various directions, perfectly agree. Von Blöde says: that the metamorphism is undeniably present where it can be recognised by observation, and explained generally by physical science. Still the class of rocks with which this is the case, is only limited, and not at all favorable to the baseless hypothesis which is now being carried to extremes. (*Neues Jahrbuch für Mineralogie*, 1844, s. 53.) Von Leonhard, Petzholdt and others, have also repeatedly declared against the too wide extension of the metamorphic theory, and we are obliged, from complete conviction, to rank ourselves with them. The transitions from gneiss, through mica-schist, into crystalline clay-slate are not to be denied, but whether the transitions from crystalline clay-slate into real greywacke slate may pass, in every case, for fully proved, may still be doubted. Grüner remarks distinctly that the clay-slate which is associated with gneiss and mica-schist is always different from the clay-slate of the greywacke; for which reason he declares himself unable to assert that these older rocks, as they appear in the departments of the Rhone and Loire, are metamorphosed greywacke slates. (*Ann. des Mines*, 3ième série, t. 19, 1841, p. 70).

In our opinion the principal difficulty, and one scarcely to be overcome, lies in the fact that there are far younger gneisses mica-schists, etc., which overlie sedimentary rocks, without the slightest transition into these underlying rocks being observable. In such cases every idea must disappear relative to a hypogenous or anogenous metamorphosis; for how could the overlying rock have been metamorphosed by some agency from beneath, while the strata beneath remain unaffected by any influence. Just as little can a catogenous metamorphosis be thought of, for whatever cause one may suppose as the real agency, it is impossible that it can have found in descending, such a sudden and entire check, along one and the same plane of deposition, that the completely re-crystallised rock, should be, by this plane of deposition, separated from the perfectly unchanged rock. In such cases there is nothing left for us but the supposition that these strati-