

at a period subsequent to the deposition of those strata.\* Professor Sedgwick and Sir R. Murchison conceive that this granite has been upheaved in a solid form; and that in breaking through the submarine deposits, with which it was not perhaps originally in contact, it has fractured them so as to form a breccia along the line of junction. This breccia consists of fragments of shale, sandstone, and limestone, with fossils of the oolite, all united together by a calcareous cement. The secondary strata, at some distance from the granite, are but slightly disturbed, but in proportion to their proximity the amount of dislocation becomes greater.

If we admit that solid hypogene rocks, whether stratified or unstratified, have in such cases been driven upwards so as to pierce through yielding sedimentary deposits, we shall be enabled to account for many geological appearances otherwise inexplicable. Thus, for example, at Weinböhla and Hohnstein, near Meissen, in Saxony, a mass of granite has been observed covering strata of the Cretaceous and Oolitic periods for the space of between 300 and 400 yards square. It appears clearly from a Memoir of Dr. B. Cotta on this subject,† that the granite was thrust into its actual position when solid. There are no intersecting veins at the junction—no alteration as if by heat, but evident signs of rubbing, and a breccia in some places, in which pieces of granite are mingled with broken fragments of the secondary rocks. As the granite overhangs both the lias and chalk, so the lias is in some places bent over strata of the cretaceous era.

*Relative age of the granites of Arran.*—In this island, the largest in the Firth of Clyde, being twenty miles in length from north to south, the four great classes of rocks, the fossiliferous, volcanic, plutonic, and metamorphic, are all conspicuously displayed within a very small area, and with their peculiar characters strongly contrasted. In the north of the island the granite rises to the height of nearly 3000 feet above the sea, terminating in mountainous peaks. (See section, fig. 702.) On the flanks of the same mountains are chloritic schists, blue roofing-slate, and other rocks of the metamorphic order (No. 1), into which the granite (No. 2) sends veins. This granite, therefore, is newer than the hypogene schists (No. 1), which it penetrates.

These schists are highly inclined. Upon them rest beds of conglomerate and sandstone (No. 3), which are referable to the Old Red formation, to which succeed various shales and limestones (No. 4) containing the fossils of the Carboniferous period, upon which are other strata of sandstone and conglomerate (upper part of No. 4), in which no fossils have been met with, which it is conjectured may belong to the New Red sandstone period. All the preceding formations are cut through by the volcanic rocks (No. 5), which consist of greenstone, basalt, pitchstone, claystone-porphry, and other varieties. These appear either in the

\* Murchison, Geol. Trans., 2d series, vol. ii. p. 307.

† Geognostische Wanderungen, Leipzig, 1838.