ingredients.[6] Again, in rocks of eruptive origin, the essential ingredients cannot be traced back further than the eruption of the mass containing them. They are not only original, as constituents of the lava, but are themselves original and non-derivative minerals, produced directly from the crystallization of molten minerals ejected from beneath the earth's crust, though, as Michel-Lévy has shown, the débris of older minerals may sometimes be traced amid the later crystals of massive rocks.[7] In rocks of aqueous origin, however, there are many, such as conglomerates and sandstones, where the component minerals, though original ingredients of the rocks, are evidently of derivative origin. The little quartz-granules of a sandstone have formed part of the rock ever since it was accumulated, and are its essential constituents. Yet each of these once formed part of some older rock, the destruction of which yielded materials for the production of the sandstone. The minute crystals of zircon, rutile, tourmaline and other minerals so often found in sands, clays, sandstones, shales and other sedimentary deposits, have been derived from the degradation of older crystalline rocks.

The same mineral may occur both as an original and as a secondary constituent. Quartz, for example, appears everywhere in both conditions; indeed, it may sometimes be found in a twofold form even in the same rock, though

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[6] Some of the "accessory" minerals may be of great importance as indicative of the conditions under which the rock was formed.

[7] Bull. Soc. Géol. France, 3d ser. iii. 199. See also Fouqué and Michel-Lévy, "Minéralogie Micrographique," p. 189. Some eruptive rocks abound in corroded or somewhat rounded or broken crystals which obviously have belonged to some previous state of consolidation. Such crystals, which are obviously more ancient than those forming the general mass of the rock, have been called *allogenic*, while those which belong to the time of formation of the rock, or to some subsequent change within the rock, are known as *authigenic*.