Of course, the preferred crystallographic orientation of the constituent grains does not always dominate the physical and mechanical behavior of the rock. Mauriño and Limousin (1966), for example, report that a compressive strength anisotropy related to macrofracture trends and bedding in the rock mass is greater than that related to a preferred orientation of quartz c axes in an orthoquartzite from Argentina.

Grain Size

It is possible to discuss the influence of grain size on mechanical behavior for two broad types of texture. The first is characterized by interlocking crystals and results from initial growth or recrystallization. The texture of metals, igneous and most metamorphic rocks, and some limestones and dolomites is of this type. The second, typical of clastic sedimentary rocks, is characterized by certain packing arrangements and grain-contact configurations.

In the former resistance to deformation tends to increase with decrease in grain size at constant composition. This effect is well known from study of polycrystalline metal (e.g., see Barrett, 1952, pp. 354-356). The crystal boundaries are viewed as an extremely thin transition region where the atomic positions represent compromises between the structural arrangements in the adjoining crystals. Thus the crystal boundaries can be viewed as a wall of dislocations where pinning is readily developed and where impurities tend to segregate. The net effect is to provide a stronger region than within the adjoining crystals. Since the total crystal surface area within an aggregate of given volume increases with decreasing grain size it follows that finer-grained aggregates will exhibit a greater resistance to deformation than the coarser-grained ones.

The contrasts between coarse-grained Yule marble and exceedingly fine-grained Solenhofen limestone illustrate this point nicely. The latter