the permeability and pore space configuration permit pervasive uniform pore pressure throughout the solid framework. This is illustrated for Berea sandstone, Mississippian, Ohio, in Figure 12. The fluid pressure in macrofractures (joints) also influences the behavior of the rock mass as will be discussed in a later section.

The second aspect of fluid saturation is discussed by Hansági (1966), Jumikis (1966), Kowalski (1966), and Ruiz (1966) in their contributions to this Congress. These authors generally agree that rock strengths decrease with increasing degree of fluid saturation. Jumikis (1966), for example, found the ultimate unconfined compressive strength of dry, weathered Brunswick shale (Triassic, New Jersey) averaged 451 bars as compared to 16-64 bars for saturated specimens. As these were unconfined tests the reduction in strength is probably caused by physicochemical mineral modification and not because of pore fluid pressure effects.* The nature of these changes that result from water saturation are poorly understood, but their influence on mechanical behavior is important and predictably such as to degrade the structural competence of the materials.

Microfractures

Habib and Bernaix (1966) have compiled a comprehensive review of the role of microfractures (fissures, cracks, minute joints) on the deformational behavior of rocks. They point out that fracturing in the hand specimen as well as in the rock mass differs only in scale, and that fractures influence a number of properties on all scales, namely: anisotropy, water saturation, intrinsic strength, mode of rupture, compressibility, Poisson's ratio, acoustic velocity, change in acoustic velocity with pressure, change in permeability with pressure, and variations in the results of rock mechanics tests between

*In saturated rocks of low permeability, however, high pore fluid pressures can prevail for short durations even in unconfined tests because of the relatively slow pressure equalization throughout the fluid phase.