DUSEL presents an opportunity to conduct world-class research on brittle and ductile faulting processes (mechanics, kinematics, and geometry) in 2- and 3-D, address long-standing principles of faulting in unweathered materials, develop new geophysical imaging techniques for faults, conduct geochemical and isotopic investigations of modern and paleofluid flow and alteration processes in and adjacent to faults, and make comparative studies with faults in similar settings worldwide. To capitalize on this research opportunity, prior knowledge of the nature and integrity of faults in any DUSEL site selected should be an integral part of engineering design and construction of the laboratory. 3-D research on large-scale faults could provide new insight into the behavior contrasts of these faults at and across major lithologic boundaries, as well as opportunities to investigate the same faults at different depths in the crust. Particular research topics will include fault mechanics and kinematics, fault fabrics, imaging technologies for dipping structures, and fluid interactions in fault zones. Shear strength will be studied with respect to both geological and engineering time scales. Faults are the products of brittle (frictional) deformation in the upper crust, and are likely to be present in all of the proposed DUSEL sites. The proposed sites differ, however, in the range of scales and the nature of faulting likely to be encountered. 3-D access via a DUSEL to a large fault at depth will enable ground-breaking research on faulting processes with worldwide applicability to significant problems.