

**Title:**

Plastic instability and fracture in ductile materials

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**Abstract:**

Instability and fracture limit the performance, safety, reliability and manufacturability of a variety of engineering components and structures; for example, the crash worthiness of automobiles, the integrity of pipelines, the blast resistance of ships and airplane cargo holds, and the manufacturability of sheet metal components. The mechanisms of instability and fracture of these components and structures are influenced by multiple length-scales. For example, the structural dimensions set the constraint effects that influence phenomena such as plastic flow localization, and the microstructural length scales dictate phenomena such as void nucleation and growth. The phenomena that occur at microstructural length scales in turn inherits the effects related to the constraints imposed by the structural dimensions. The coupling or competition between these length scales may in turn result in evolution of new length scales. Correlating these length scales with instability and failure mechanisms will provide a direct link essential for development of new materials and structures as well as modeling and control of catastrophic failures. This invited session aims at gathering researchers from all horizons of computational mechanics in order to present their recent developments and results pertaining to modeling plastic instability and fracture in ductile materials.