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Hosts: Jerry Floro and Matt Begley

Title: "From Pop-in to Pillars: The Utility of Nanoindentation in the Study of Small-Scale Plasticity"

Date: Monday, November 10

Time: 4:00 to 5:00 PM

Refreshments: 3:30 to 4:00

Room: Ruffner Hall, G004C

ABSTRACT:

Since its development in the mid-1980's, nanoindentation has proven to be a primary tool for discovering and characterizing a variety of unique deformation phenomena that have improved our understanding of the mechanisms of small-scale plasticity. Among these are the indentation size effect, in which hardness at small length scales increases due to plastic strain gradients; indentation pop-in, in which sudden displacement excursions are caused by homogenous nucleation of dislocations at stresses approaching the theoretical strength; and micro-pillar testing, in which the nanoindenter is used as a small-scale compression testing apparatus to explore deformation phenomena in samples small enough to probe single dislocation events. Many of these phenomena are interrelated in ways which are not at first obvious, and studying them by nanoindentation methods can be used to quantify some of the fundamental "unit events" that control dislocation plasticity. In this presentation, experimental observations are presented for a unique new class of micro-pillar specimens prepared by methods that don't suffer from damage imparted by focused beam ion milling. The observations are explained by means of pop-in studies in similar materials.