

mechanical science & engineering seminar

2018-2019

Midwest Mechanics Tour!



Prof. Davide Bigoni
University of Trento
Italy

Folding of ductile solids and Eshelby forces in elastic rods

When a ductile material is subject to severe strain, failure is precluded by the emergence of shear bands, which initially nucleate in a small area, but quickly extend rectilinearly and accumulate damage, until they degenerate into fractures. This is a known phenomenon which has attracted a strong research effort in the last 30 years. The same mathematical tools developed for the analysis of shear bands in ductile materials will be shown to lead to folding and faulting in constrained Cosserat materials, when these have a strong anisotropy, so that they are close to the elliptic boundary. In fact, folding is a process in which bending is localized at sharp edges separated by almost undeformed elements and folding in these materials can originate from ellipticity loss.

Shear banding is shown to inspire tensile buckling of an elastic rod and development of configurational, or 'Eshelby-like', forces in elastic structures, leading to the elastica arm scale and to models of snake locomotion and self-restabilization.

190 Eng.
Sciences Bldg.

Tuesday

2

April

3:00

PM