

Department of Civil Engineering and Engineering Mechanics
Columbia University

DEPARTMENT SEMINAR



Professor Daniel Rittel
Faculty of Mechanical Engineering
TECHNION - IIT

IS ADIABATIC SHEAR FAILURE REALLY ADIABATIC?

Thursday, August 18th, 2011 at 11:00 am - 627 Mudd

ABSTRACT

Adiabatic shear failure is a dynamic failure mechanism that results from the formation of a localized narrow band in which the shear strain concentrates and reaches very high values. An early and well accepted analysis of ASB formation relies on the competition between strain-hardening and thermal softening, so that when the latter overcomes the former, the material can no longer harden and fails by shear localization. Therefore, the role of thermally induced strain-softening is viewed as central in ASB formation.

We propose another approach to the phenomenon, based on the dynamically stored energy of cold work, the latter being identified as a key factor for the onset of shear localization. This energy affects and dictates the microstructural re-arrangements (dynamic recrystallization, twinning) occurring during dynamic deformation. In this talk, we will present experimental results on the evolution of the temperature and the microstructure of the dynamically sheared material, and a model describing its evolution. These results will be discussed to propose another physical explanation to dynamic shear localization as a microstructure-related instability.

Biography:

D. Rittel holds a PhD in Materials Science (1988) from the Hebrew University of Jerusalem. He spent 2 years as a postdoc at Yale University working on the fracture of tungsten base heavy alloys, followed by 3.5 years at Ecole Polytechnique (France), working on experimental dynamic fracture mechanics. He then joined Technion (Mechanical Engineering) in 1994 where he founded the Dynamic Fracture Laboratory.

As of today, D. Rittel holds the Zandman Chair in Experimental Mechanics, heads the Materials Mechanics Center. He is also the Deputy Senior Vice President (Vice Provost) of Technion. Since 2000, D. Rittel visits regularly Caltech (Graduate Aeronautical Laboratories, Ravichandran's group), where he was the Clark B. Millikan Visiting Professor in Aeronautics (2006-2007).

Throughout the years, D. Rittel has developed expertise in the many aspects of dynamic failure, including fracture mechanics, constitutive behavior, dynamic failure mechanisms and numerical modeling. D. Rittel is also active in the field of Structural Health Monitoring.

D. Rittel's interest is in the thermomechanics and physics of dynamic failure with regard to dynamic fragmentation, fracture, adiabatic shear banding and hysteretic heating.

Dr. Rittel is also Associate Editor of *Experimental Mechanics*, *Mechanics of Materials* and the *International Journal of Engineering Science*.