



Institute for Materials Science

UNCLASSIFIED

IMS Distinguished Lecturer Series



Professor Alan Needleman
Department of Materials Science & Engineering
Texas A&M University
College Station, TX

Roughness, Toughness and the Possibility of Crack Path Engineering

Wednesday, January 31, 2018

2:00-3:00

MSL auditorium (TA-03 - Bldg 1698 - Room A103)

Abstract: Fracture surfaces of structural metals are rough and the statistics of that roughness are largely set by the material microstructure together with the nature of the imposed loading. A material's resistance to crack growth is also set by the same factors. Hence a basic question is: what is the relation, if any, between measures of the statistics of fracture surface roughness and measures of the material's crack growth resistance? Simulations of ductile fracture will be discussed that address this issue. The calculations are carried out within a continuum mechanics framework with a model of void nucleation, growth and coalescence incorporated into the constitutive relation. Results of the simulations suggest that a material's crack ductile growth resistance can be significantly increased by suitably designing the microstructure to control the crack path. In addition, it is found that there are circumstances where suitably adding defects to a material can alter the crack path in a way that increases its ductile fracture resistance.

Bio: Alan Needleman received his B.S. in Mechanical Engineering from the University of Pennsylvania and M.S. and Ph.D. degrees in Engineering from Harvard University. He spent five years in Applied Mathematics at MIT before moving to Brown University where he became Florence Pirce Grant University Professor. After retiring from Brown, he moved to the University of North Texas (UNT) and then to Texas A&M University, where he is a University Distinguished Professor and a TEES Distinguished Research Professor in the Department of Materials Science and Engineering. He is a member of the National Academy of Engineering and of the American Academy of Arts and Sciences, has been awarded the Prager Medal by the Society of Engineering Science, and the Drucker and Timoshenko Medals by the American Society of Mechanical Engineers. He also holds honorary doctorates from the Technical University of Denmark and Ecole Normale Superior de Cachan (France), and is an Honorary Professor of Dalian University of Technology (China).

To be on Professor Needleman's Agenda, to participate in the Early Career Lunch, or for general information contact
LeAndra Tafoya * leandra@lanl.gov * 665-9183

Hosted by Alexander Balatsky * Director of the institute for Materials Science