



Laboratoire de Mécanique des Solides  
École Polytechnique  
<http://www.lms.polytechnique.fr>

Parrainé par la Chaire André Citroën



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# *Symposium*

# *Jean Mandel*

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*Endommagement et Rupture*

*Damage and Fracture*



Jeudi 7 juin 2012

Amphithéâtre Gay-Lussac  
École Polytechnique

Inscription gratuite sur simple email à [lms@lms.polytechnique.fr](mailto:lms@lms.polytechnique.fr) avant le 18 mai 2012  
Free registration by email at [lms@lms.polytechnique.fr](mailto:lms@lms.polytechnique.fr) by May, 18<sup>th</sup>, 2012  
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# Plenary Lecture

by Krishnaswamy Ravi-Chandar

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## *Dynamic Strain Localization and Fragmentation*

The tensile constitutive and failure behavior of ductile metals at high strain rates —between 1,000 and 15,000 per second— is considered. An electromagnetically driven expanding ring/tube experiment is used as the primary tool for examining the material behavior in this range of strain rates. Mechanistic and statistical aspects of strain localization and fragmentation, modeled through conventional elasto-plastic theory and the idea of the Mott release waves, will be described. Similarities and differences between quasi-static and dynamic localization will be explored through variation of specimen geometry, size and inherent material properties. Application of the idea to blast protection of structures and to manufacturing processes will be discussed as the primary motivating problem.

## Krishnaswamy Ravi-Chandar

Professor of Aerospace Engineering and Engineering Mechanics, University of Texas at Austin  
Associate Director of the Research Center for Mechanics of Solids, Structures and Materials  
*The University of Texas at Austin, Austin, TX 78712-0235, USA*

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Professor Ravi-Chandar received an undergraduate degree in Aeronautical Engineering with first class honors in 1976 from the Madras Institute of Technology in India and graduate degrees in Aeronautics from the California Institute of Technology (M.S. 1977, Ph.D. 1982). He began his academic career at the University of Houston in 1983 and moved to the University of Texas at Austin in September 2000.

Professor Ravi-Chandar's research interests lie in the general area of mechanical behavior of solids with a particular emphasis on high-strain-rate fracture behavior. His current thrusts are in the areas of dynamic fracture, inelastic behavior of polymers and composites, and wave propagation in shape memory alloys. While interest in these problems is motivated by their enormous practical importance, the focus of the research is on the generation of a fundamental understanding of the way in which materials deform and fail. This requires a well-integrated experimental and theoretical study, conducted at various spatial and temporal resolutions. Accordingly, his laboratory facilities are geared toward performing experiments specially designed to elucidate these characteristics of material behavior.

Professor Ravi-Chandar's scholarly contributions are well recognized; he has presented a number of invited lectures at national and international meetings. He has also been a consultant to a number of companies dealing with problems of structural integrity.

# Thursday, June 7, 2012 Program

Gay-Lussac Amphitheater

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- 8:15 - 8:45 am *Welcome Coffee*
- 8:45 - 9:00 am **Welcome Address** by **Patrick Le Tallec**, LMS director
- 9:00 - 10:00 am **Plenary Lecture** by **Krishnaswamy Ravi-Chandar**  
*Dynamic strain localization and fragmentation*
- 10:00 - 10:30 am *Coffee Break*
- 10:30 - 11:00 am **Camille Gouttebroze**  
*Comparison of crack initiation models for media under thermal load*
- 11:00 - 11:30 am **Paul Sicsic**  
*Crack initiation driven by drying or cooling: a variational approach*
- 11:30 - 12:00 pm **Jean-Baptiste Esnault**  
*A three-dimensional analysis of fatigue crack paths in thin metallic sheets*
- 12:00 - 1:30 pm *Lunch in Jean Mandel Room*
- 1:30 - 2:00 pm **Elias Merhy**  
*Crack growth characterization of the A356-T7 aluminum alloy under thermo-mechanical fatigue loading*
- 2:00 - 2:30 pm **Joachim Guillie**  
*On the coupling between shape variation and material dissipation for the computation of the crack driving force*
- 2:30 - 3:00 pm **Stefano Bosia**  
*A dynamical system approach to high-cycle-fatigue life predictions*
- 3:00 - 3:30 pm **Fabien Ebnoether**  
*Predicting ductile fracture of low carbon steel sheets: strain-based versus stress-based Mohr-Coulomb model*
- 3:30 - 4:00 pm *Coffee Break*
- 4:00 - 4:30 pm **Matthieu Dunand**  
*Microscopic analysis and modeling of the fracture mechanisms of advanced high-strength steel sheets*
- 4:30 - 5:00 pm **Jessica Papisidero**  
*Characterization of the effect of stress state on fracture based combined tension-torsion experiments*
- 5:00 - 5:30 pm **Neji Ben Ali**  
*Experimental and numerical study of porous borosilicate glass fracture under triaxial tension*
- 5:30 - 6:00 pm **Vivien Courtier**  
*Extended transformation field analysis using adaptive hyper-reduction*
- 6:00 - 6:15 pm **Closing Address** by **Patrick Le Tallec**

# Jean Mandel

Founder of the Laboratoire de Mécanique des Solides

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After brilliant secondary studies, Jean Mandel went on to École Polytechnique in 1927 and later to École des Mines. In 1932 he became a professor at École des Mines de Saint-Étienne and in 1948 at École des Mines de Paris. From 1951 to 1973 he was professor of mechanics at École Polytechnique.

Jean Mandel's research career was devoted mainly to the mechanics of solids and the strength of materials. In 1961 he created the Laboratoire de Mécanique des Solides — a laboratory common to École Polytechnique, École des Mines de Paris, École des Ponts et Chaussées and associated to the Centre National de la Recherche Scientifique. In October 1964 he founded and became the first president of the Groupe Français de Rhéologie. In 1980 he became "honorary member" of this group.

The scientific work of Jean Mandel covers a very wide field with a bibliography listing more than 150 articles and 5 books. He presented original ideas on the buckling of beams and shells, the finite deformations of solids, laminar flow in porous media, the bearing capacity of shallow foundations, the punch resistance of a two-layer medium, the stability of underground cavities, the plastic flow of metals, and the effect of cyclic loading on structures, as well as contributions to the fields of thermodynamics, rolling friction and homogenization.

But Jean Mandel's influence extended far beyond the field of his personal research. A good many students were trained, under his direction, in the Laboratoire de Mécanique des Solides. A fine teacher and a constant stimulus to his research group, he gave his time generously to study the details of manuscripts that were sent to him and to suggest the minor modifications he deemed necessary. Those who had the privilege of working with him were left with an impression of palpable scientific passion and moral rigor that will continue to be an example for generations to come.

Jean Mandel passed away on the 19th of July 1982, the victim of a tragic accident at the very height of his intellectual prime.

Text by Pierre Habib

***The Jean Mandel Symposium is open to all students, researchers and scientists interested in the proposed topic. It combines, in an informal setting, a keynote presentation by an internationally renowned scientist and talks given by young researchers associated with the laboratory. A large amount of time is dedicated to scientific discussions.***