



Laboratoire de Mécanique des Solides
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Parrainé par la Chaire André Citroën



Symposium

Jean Mandel

*Meta-materials and
architected materials*

Méta-matériaux et matériaux architecturés

Thursday, June 30th, 2016

Faure Amphitheatre
École Polytechnique

Inscription gratuite par simple email à symposium@lms.polytechnique.fr avant le 31 mai 2016
Free registration by email at symposium@lms.polytechnique.fr by May, 31st 2016
Contact : weisz@lms.polytechnique.fr

Plenary Lecture

by Chiara Daraio

Design of new materials for health, energy and the environment

Throughout history, the discovery of new materials and the ability to shape them has been the seed for technological innovation. Today, the boundary between structures and materials is blurred, enabling a new way to think about materials' innovation. Materials can now be engineered, not only by manipulating their atomic structure and composition, but also by designing the geometry of their microstructure. Additive manufacturing approaches allow constructing arbitrary shapes with different materials, controlling geometries from the nanometer to the meter scale. This enables the concept of programmable materials, or materials made-to-order, to fulfill specific needs of applications. By exploiting geometrical effects, like bending and buckling of beams or contact between particles, it is possible to design materials with customized deformation responses, controllable stiffness and multifunctional properties. We have constructed new materials that exploit geometry to redirect sound for ultrasonic applications or elastic vibrations for noise mitigation, and we are designing seismic meta-materials that can protect buildings from earthquakes.

Chiara Daraio

Professor and Chair of Mechanics and Materials
Materials by Design and Nonlinear Dynamics

ETH, Zürich, Switzerland



Professor Daraio received undergraduate degree in Mechanical Engineering from the Università Politecnica delle Marche, Italy (2001). She received her M.S. (2003) and Ph.D. degree (2006) in Materials Science and Engineering from the University of California, San Diego. She joined the faculty of the California Institute of Technology (Caltech) in fall of 2006 and was promoted full professor in 2010. In January 1st, 2013, she joined the department of Mechanical and Process Engineering at ETH Zürich, with a chair in Mechanics and Materials. She has won several awards. Among these, she received a Presidential Early Career Award (PECASE) from the White House in 2012, was elected as a Sloan Research Fellow in 2011 and received an ONR Young Investigator Award in 2010. She is also a winner of the NSF CAREER award (2009), of the Richard Von Mises Prize (2008) and the Hetenyi Award (2015). She was selected by Popular Science magazine among the "Brilliant 10" (2010). For a complete list of her publication and research information: <http://www.mechmat.ethz.ch>.

Thursday, June 30th, 2016 Program

Faurre Amphitheater

- 8:45 - 9:15 am *Registration and Welcome Coffee*
- 9:15 - 9:30 am **Welcome Address** by **Patrick Le Tallec**, LMS director
- 9:30 - 10:30 am **Plenary Lecture** by **Chiara Daraio**
Design of new materials for health, energy and the environment
- 10:30 - 11:00 am *Coffee Break*
- 11:00 - 11:30 am **Jean-Pierre Voropaieff**
Effect of microstructure and architecture in magnetorheological elastomers behavior
- 11:30 - 12:00 pm **Guangyang Wen**
Localization of Deformation and Loss of Macroscopic Ellipticity in Microstructured Solids
- 12:00 – 12:30 pm **Laurent Guin**
Atomistically derived cohesive zone model of intergranular fracture in polycrystalline graphene.
- 12:30 - 2:00 pm *Lunch*
- 2:00 - 2:30 pm **Erato Psarra**
Instabilities of MRE film - substrate block under magneto-mechanical loadings
- 2:30 - 3:00 pm **Sebastian Krödel**
Ultrasonic wave propagation in microlattice materials
- 3:00 - 3:30 pm **Alexis Faure**
Design of architected materials using the level set method
- 3:30 - 4:00 pm **Anton Bauhofer**
Two-Photon Polymerization of Thin Self-Folding Sheets
- 4:00 - 4:30 pm *Coffee Break*
- 4:30 – 5:00 **Perle Geoffroy**
Homogenization method for lattice structure topology optimization
- 5:00 - 5:30 pm **Lai Changquan**
The motion of fluid on nanostructured surfaces
- 5:30 - 5:45 pm **Closing Address** by **Patrick Le Tallec**

Jean Mandel

Founder of the Laboratoire de Mécanique des Solides



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.