



Laboratoire de Mécanique des Solides
<https://portail.polytechnique.edu/lms/fr>



Parrainé par la Chaire André Citroën



Symposium

Jean Mandel

*Problems in Non-Linear
Mechanics*

Problèmes de mécanique non-linéaire

Thursday, June 1st, 2017

Becquerel Amphitheatre
École Polytechnique

Inscription gratuite à symposium-mandel@meslistes.polytechnique.fr avant le 15 mai 2016
Free registration by email at symposium-mandel@meslistes.polytechnique.fr by May, 15th 2016
Contact : daniel.weisz-patrault@polytechnique.edu

Plenary Lecture

by Timothy J. Healey

Symmetry-Breaking Global Bifurcation in Nonlinear Problems of Elasticity

Mechanical experiments on real structures and materials often begin with an ostensibly symmetric specimen subject to quasi-static loading, temperature, etc. Thresholds of instabilities, characterized by the emergence of increasingly complex patterns or configurations, are sought. Global symmetry-breaking bifurcation/continuation methods combined with stability analysis provide a systematic mathematical approach to understanding and predicting such complex behavior. In this talk we present several specific examples in models for solid-solid phase transitions, highly deformable membranes, and two-phase lipid-bilayer vesicles. In each of these cases, “small” geometric and material parameters, as well as loading parameters, are employed advantageously in the continuation scheme. Unlike the situation in local asymptotic bifurcation theory, the most interesting behavior is found globally, i.e., “far” from the family of trivial (symmetry-preserving).

Timothy J. Healey

Professor

Department of mathematics

Cornell University



Tim Healey works at the interface between the mechanics of nonlinearly elastic structures and solids and mathematical analysis. At the start of his career he pioneered the use of group-theoretic methods in global bifurcation analysis, leading to (i) efficient numerical methods in computational bifurcation and (ii) detailed analyses of nonlinear elliptic PDEs with symmetry. He is also well known for the development of a Fredholm degree leading to the existence of solutions “in the large” in nonlinear continuum mechanics, and for developing models of chirality in Cosserat rod theory. Most recently he is focused on the modeling and analysis of thin elastic surfaces — in particular, wrinkling in highly stretched thin sheets, and pattern formation in fluid-elastic (lipid-bilayer) vesicles. Tim Healey holds engineering degrees from the University of Missouri, Columbia (BS 1976) and the University of Illinois, Urbana-Champaign (MS 1978, PhD. 1984), during which time he studied mathematics, civil engineering, theoretical mechanics and mathematics – in that order. From 1978-80, before his PhD studies, he was a licensed engineer at a consulting firm in the Los Angeles area. He spent one year as a visiting professor of Mathematics at the University of Maryland before joining the Cornell faculty in 1985. At Cornell he has held positions in the Department of Theoretical & Applied Mechanics (1985-2008), including Chair of the Department (2000-2008), and a joint appointment in the Departments of Mathematics and Mechanical & Aerospace Engineering (2009-2014). Currently he holds a full-time appointment in the Department of Mathematics. Throughout his career he has given numerous invited presentations and key-note addresses, and has enjoyed nearly continuous support from the National Science Foundation for his research. He is the recipient of 4 teaching prizes at Cornell. He serves on several editorial boards, and has served in various leadership roles on committees and organizations representing the science of mechanics. He has held numerous visiting positions throughout his career – including the current one-year distinguished visiting professorship here in LMS at Ecole Polytechnique.

Thursday, June 1st, 2017 Program

Becquerel 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 **Timothy J. Healey**
Symmetry-Breaking Global Bifurcation in Nonlinear Problems of Elasticity.
- 10:30 - 11:00 am *Coffee Break*
- 11:00 - 11:30 am **Arthur Fischer**
Gradient damage models applied to dynamic ductile fragmentation.
- 11:30 - 12:00 pm **Blandine Crabbé**
Gradient damage models for large deformation.
- 12:00 – 12:30 pm **Anthony Janin**
Characterization of adhesive joints under dynamic multiaxial loadings
- 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 **Jean-Pierre Voropaieff**
Modeling and Identification of the constitutive behavior of magneto-rheological elastomers.
- 3:00 - 3:30 pm **Laurent Guin**
p-n junction under non-uniform strain with an application to photovoltaics.
- 3:30 - 4:00 pm *Coffee Break*
- 4:00 - 4:30 pm **Ustim Khristenko**
Delayed feedback control method for calculating space-time periodic solution of evolution problems.
- 4:30 – 5:00 **Vincent Roggerone**
Non-linear dynamic identification.
- 5:00 - 5:30 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.