



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

Parrainé par la Chaire André Citroën



Jean Mandel

Symposium

Thursday, June 24th, 2021

Faure Amphitheater

École Polytechnique

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.

Contact: stella.brach@polytechnique.edu

Plenary Lecture

Prof. Djimédo Kondo

On the proper use of the generalized standard materials framework

Since the pioneering work of Halphen and Nguyen (1975) (see also Germain et al., 1983), the Generalized Standard Materials (GSM) framework has been well recognized as a powerful methodology to model and predict (thermo)mechanical responses of various dissipative materials and structures. This is mainly due to the various physical mechanisms that the framework can account for, and to the resulting variational nature of the corresponding evolution problems that generally leads to efficient numerical implementations. I will start by recalling the main basic ingredients of the GSM approach, including the possible dependence of the dissipation potentials on the state variables. Then, I will illustrate and discuss the efficiency of the GSM-based methodology via three ongoing studies:

- Plasticity of porous materials. Revisitation of the Gurson model and computational issues;
- Nonlinear homogenization of composites with hardening. Incremental Variational Methods;
- Analysis of energetic/dissipative gradient damage models and their variational formulation.

In each case, I will briefly present the corresponding theoretical formulation and provide qualitative results and quantitative numerical predictions. I will recall some limitations of the GSM framework, and finally indicate how it can be extended and exploited in the case of non standard materials. This seminar also aims to pay tribute to **Professor Nguyen Quoc Son**.

References

- 1) Halphen, B., Nguyen, Q.-S., *Journal de Mécanique* (1975), 14, 39–63.
- 2) Germain, P., Nguyen, Q. S. and Suquet, P., *Journal of Applied Mechanics* (1983) 50, 1010–1020.
- 3) Nguyen, Q. S., John Wiley and Sons (2000), Chichester
- 4) Lahellec, N. And Suquet, P., *Journal of the Mech. & Phys. of Solids* 55 (2007) 1932–1963.
- 5) Lorentz, E. and Godard, V., *Computer Methods in Applied Mechanics and Engineering*, (2011) 200 (21):1927 –1944.
- 6) Habibou Maitournam, Edition Polytechnique, 2012.
- 7) Bouby, C., Kondo D, and de Saxcé G., *European Journal of Mechanics A/Solids* 53 (2015) 48-61
- 8) Nguyen Q.-S., *Journal of the Mechanics and Physics of Solids* 97 (2016) 156–167
- 9) Agoras M., Avazmohammadi, R. and Ponte Castañeda, P., *Int. Journ. of Solids & Structures* 97-98 (2016) 668–686.
- 10) Marigo J.-J., Maurini C. and Pham K., *Meccanica* (2016) 51:3107–3128
- 11) Lucchetta, A., Auslender, F., Bornert, M., Kondo, D., *Int. J. Solids Struct.* (2019) 158, 243–267.
- 12) Nguyen Q.S., *Int. Journ. of Solids & Structures*, (2021). *In press*.

Prof. Djimédo Kondo - *Institut Jean Le Rond D’Alembert, Sorbonne Université*



Djimédo Kondo received his Ph.D. in 1989 at the University of Lille, where he worked as a full professor till 2010. He then moved to Sorbonne University at the Institut Jean Le Rond D’Alembert, where he holds a full professorship of exceptional class. Since 2013, he is director of the Doctoral School of Engineering SMAER of Paris. He published more than 150 papers in international journals and 3 books on micromechanics of fracture and damage, poromechanics and continuum mechanics.

Program

Faure Amphitheater

- 8h45 – 9h00 Welcome: *Andrei Costantinescu*, head of LMS
- 9h00 – 10h00 Plenary Lecture: *Djimédo Kondo*, Sorbonne Université
On the proper use of the generalized standard materials framework
- 10h00 – 10h15 *Nikhil Mohanan*, LMS, 1st year PhD student
A thermo-elasto-viscoplastic FE model to study microstructure evolution of polycrystals due to intrinsic heat treatment during AM
Advisor: Manas Upadhyay
- 10h15 – 10h30 *Antoni Joubert*, LMS, 2nd year PhD student
Free vibration optimization of viscoelastic cantilever beams and plates
Advisors: Julie Diani, Grégoire Allaire and Samuel Amstutz
- 10h30 – 10h45 *Jessica Manganotti*, LMS, 2nd year PhD student
Flow recovery from distal pressure by optimal control strategy
Advisors: Philippe Moireau and Sebastien Imperiale
- 10h45 – 11h00 Break
- 11h00 – 11h15 *Nikolai Khailov*, LMS, 3rd year PhD student
Cyclic behavior of gyroid structure. Secondary crack effect
Advisors: Andrei Constantinescu and Eric Charkaluk
- 11h15 – 11h30 *Filippo Agnelli*, LMS, 3rd year PhD student
Computational design of shape shifting panels using a level set topology optimisation
Advisor: Andrei Constantinescu
- 11h30 – 11h45 *Alexander Edwards*, LMS, 1st year postdoc
Project QUADS: Additive Manufacturing of duplex stainless steels for extreme corrosive environments and specialised applications
Advisor: Eric Charkaluk
- 11h45 – 12h00 *Solenne Collomb*, LMS, 1st year postdoc
Multi-scale analysis of strain mechanisms during in situ cyclic test
Advisors: Andrei Constantinescu and Eric Charkaluk
- 12h00 – 12h15 *François Kimmig*, LMS, 2nd year postdoc
Cardiovascular modelling and data assimilation for augmented monitoring in general anaesthesia
Advisor: Philippe Moireau
- 13h00 Lunch time and discussion

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 CNRS. 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.

Pierre Habib