



**POLITECNICO
DI TORINO**



Dipartimento di
Scienze Matematiche
G. L. Lagrange

ECCELLENZA 2018 • 2022

Tuesday the **23 October 2018** at 10:00
Politecnico di Torino, DISMA, Aula Buzano (third floor)

Marco MORANDOTTI

Assistant Professor at Politecnico di Torino

Variational methods for Mechanics... and something more

Prof. Davide Carlo Ambrosi introduces the seminar

Abstract

The study of materials and their mechanical, physical, and chemical properties has challenged scientists in the last centuries. The advances in modern Mathematics, including the theoretical developments and the computational aspects, make it now possible to study models to describe the deformations of continuum bodies in various regimes. Mathematical Analysis and Continuum Mechanics provide the right tools to build and study these models; in particular, variational techniques are successfully used to minimise the energy associated with a deformation in order to find the equilibrium configurations of a body subject to external forces.

In this seminar, Dr Morandotti will present some results concerning problems stemming from mechanics and materials science that are successfully tackled with techniques from the calculus of variations. Specifically, he will introduce some problems concerning dislocations in crystalline solids: it is important to study the motion of dislocations and their effects when more and more of them are nucleated, to determine the alteration of the mechanical properties of a defected body. He will then move to structured deformations, which were proposed as a multi-scale mechanical theory that captures the contributions at the macroscopic level of both smooth and non-smooth geometrical changes (disarrangements) at submacroscopic levels. In the framework of an energetic formulation, structured deformations are a powerful tool to bridge mechanical responses at different length scales. Dr Morandotti will show some results concerning energy relaxation and integral representation.

Finally, he will conclude by addressing a mean-field model for a system of distributed players whose strategies evolve according to the replicator dynamics influenced by the players' distribution: a strategy is either enhanced or suppressed according to its performance with respect to the other available ones. The model, presented here as a mean-field limit, besides recovering a discrete-to-continuum process similar to the one used for the upscaling of dislocations, suggests applications to multi-particle dynamical systems.

Biography

Marco Morandotti is a researcher in Applied Mathematics, holding a position of Assistant professor at the Department of Mathematical Sciences of Politecnico di Torino.

During his career, he worked at Instituto Superior Técnico (Lisbon, Portugal) and Carnegie Mellon University (Pittsburgh, PA, USA) within the CMU|Portugal partnership and then, as a post-doc fellow, he moved to SISSA (Trieste, Italy) and TUM (Munich, Germany). He obtained his PhD from SISSA, in Trieste, Italy, after his higher education at the University of Pavia. His current research interests include Calculus of Variations and Partial Differential Equations, and their applications to Mechanics, Materials Science, Biology.

Save the date for the next event: *October 30, 2018*

More info on www.polito.it/disma-excellence