

SEMINAR



SERIES

北京大学工学院

力学与工程科学系

湍流与复杂系统国家重点实验室

Configurational forces, elastic balances, torsional guns, and the dripping of elastic rods

Speaker: Professor Davide Bigoni

University of Trento, Italy

Abstract

The existence of Eshelby or configurational forces acting on elastic structures is theoretically and experimentally demonstrated [1]. These forces have a strong influence on structural behaviour and a counterintuitive behaviour [2]; they are exploited in two particular cases: the elastica arm scale [3] and the torsional actuator [4]. In the former case, the concept of deformable arm scale (completely different from a traditional rigid arm balance) is theoretically introduced and experimentally validated. The idea is not intuitive, but is the result of nonlinear equilibrium kinematics of rods inducing configurational forces, so that deflection of the arms becomes necessary for the equilibrium, which would be impossible for a rigid system. In the latter case, torsionally-induced locomotion is demonstrated and is given direct evidence in the realization of a torsional gun capable of transforming torque into propulsive force.

References:

- [1] D. Bigoni, F. Dal Corso, F. Bosi and D. Misseroni, Eshelby-like forces acting on elastic structures: theoretical and experimental proof. *Mech. Materials*, 2015, 80, 368-74.
- [2] D. Bigoni, F. Bosi, F. Dal Corso and D. Misseroni, Instability of a penetrating blade. *J. Mech. Phys. Solids*, 2014, 64, 411-425
- [3] F. Bosi, F. Dal Corso, D. Misseroni and D. Bigoni An elastica arm scale. *Proc. Royal Soc. A*, 2014, 470
- [4] D. Bigoni, F. Dal Corso, D. Misseroni and F. Bosi, Torsional locomotion. *Proc. Royal Soc. A*, 2014, 20140599.

Chair: Prof. Z.P. Huang (黄筑平教授)

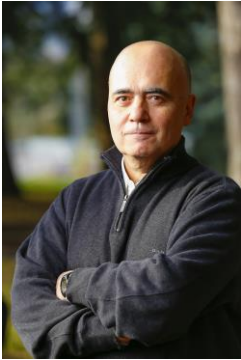
Time: May 29, Friday, 3:00pm-4:30pm

5月29日(周四)下午3:00-4:30

Place: Mechanics Building Room 434 (力学楼434会议室)

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About the Speaker



Davide Bigoni

Professor of Solid and Structural Mechanics

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Awards and Distinctions

Elected Euromech Fellow (of the European Mechanics Society, 2009)

The Ceramic Technology Transfer Day Award (of the ACIMAC and ISTEC-CNR, 2012)

Doctor Honoris Causa degree at the Ovidius University of Constanta (2014)

Editorial

Co-editor, *Journal of Mechanics of Materials and Structures*

Associate Editor, *Mechanics Research Communications*

Member of the editorial boards: *Archives of Mechanics*, *International Journal for Computational Methods in Engineering Science and Mechanics*, *Journal of Elasticity*, *Journal of the Mechanical Behavior of Materials*, *Acta Mechanica Sinica*, and *International Journal of Solids and Structures*

Panel member and Reviewer for Research Grants

Vice chair: *Panel PE8 for the European Research Council Starting Grants*

Panel member: *Swiss National Science Foundation Starting Grants*, *Excellence Initiative funded by the Government of Spain*, *Romanian National Council for Development and Innovation*

Reviewer: *Deutsche Forschungsgemeinschaft*, *EPSRC Research Grants (UK)*, *Irish Research Council*, *Research Council of Norway*, *Technology Foundation STW of Netherlands*, *Israel Science Foundation*

Research Interests

Material modeling (nonlinear elasticity, damage, elastoplasticity, visco- and thermo- plasticity, with applications to ceramic materials, granular media, composites, metals, and biomaterials),

Wave propagation in solids (with applications to metamaterials),

Fracture mechanics (with applications to porous media, and rock-like materials) ,

Structural mechanics (with an emphasis on bifurcation and instability).

Publications

More than 90 journal papers and has published a book