Midwest Mechanics Seminar Series
Tuesday, October 30, 2018
10:15 a.m., 3540 Engineering Building
Refreshments Served at 10:00 a.m.

Folding of continua and fluttering of rods as instabilities in solids and structures

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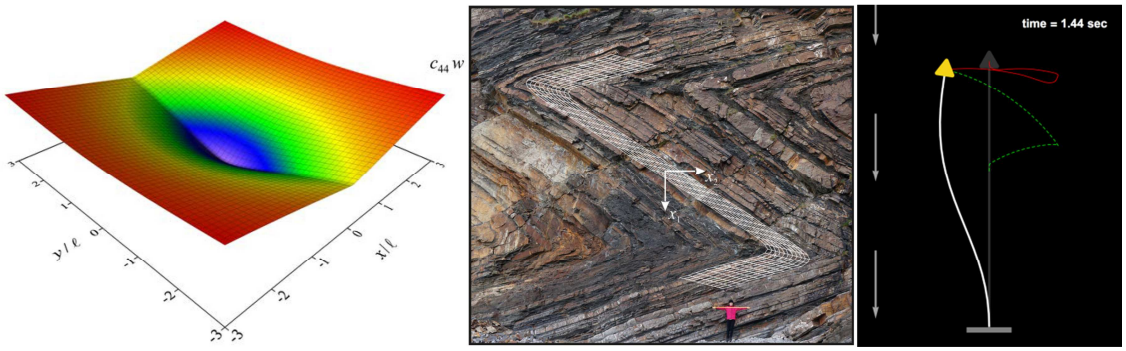
Abstract: Folding in a three-dimensional elastic continuum is investigated as a constitutive instability for a constrained Cosserat material, characterized by a strong anisotropy, in a way that the material is close to the elliptic boundary. Folding is explained as a process in which bending localizes at sharp edges separated by almost undeformed elements, so that folding in these materials can originate from ellipticity loss. Finally, faulting, the spontaneous formation of a finite-size discontinuity, will be shown to be also possible in the mentioned materials [1].

Flutter instability of an elastic rod subject to a follower force at one end is an example of Hopf bifurcation. This is characterized by the so-called 'Ziegler paradox', related to a decrease in the critical load, as connected to an increase in the viscous dissipation of the system. A new experimental apparatus is presented through which the first experimental validation of the detrimental effect of the viscous dissipation on the critical load is provided [2].



From left to right: Folding of an elastic Cosserat solid; modeling of a Chevron folding; flutter of an elastic rod

References

[1] D. Bigoni and P.A. Gourgiotis (2016) Folding and faulting of an elastic continuum. *Proc. Royal Soc. A*, 472.

[2] Bigoni, D., Kirillov, O., Misseroni, D., Noselli, G.Tommasini, M. (2018) Flutter and divergence instability in the Pflüger column: Experimental evidence of the Ziegler destabilization paradox. *J. Mech. Phys. Solids* 116, 99-116.

BIOGRAPHY Davide Bigoni is a mechanician working in solid and structural mechanics and material modeling, wave propagation, fracture mechanics. His approach to research is the employment of a broad vision of mechanics, with a combination of mathematical modelling, numerical simulation, and experimental validation. From 2001 Davide Bigoni holds a professor position at the University of Trento, where he is leading a group of excellent researchers in the field of Solid and Structural Mechanics.

He has authored or co-authored more than 100 journal papers and has published a book on nonlinear Solid Mechanics. He was elected in 2009 Euromech Fellow (of the European Mechanics Society), has received in 2012 the Ceramic Technology Transfer Day Award (of the ACIMAC and ISTEC-CNR), in 2014 the Doctor Honoris Causa degree at the Ovidius University of Constanta and in 2016 the Panetti and Ferrari Award for Applied Mechanics (from Accademia delle Scienze di Torino). He has been awarded an ERC advanced grant in 2013. He is co-editor of the Journal of Mechanics of Materials and Structures and associate Editor of Mechanics Research Communications and in the editorial board of 8 international journals.

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