



April 16, 2025

Dear All,

We would like to invite you to attend the IPPT PAN Seminar on Mechanics in honor of W. Olszak and A. Sawczuk, which will be delivered by

Professor Davide Bigoni
Instabilities Lab
Università di Trento, Italy

The title of the presentation is:

Harnessing structural instabilities to explore material instability

The seminar will be held on:

April 20, 2026 (Monday) at 11:00
online via gotomeeting program under the link:
<https://global.gotomeeting.com/join/810943621>

2026-04-20

11:00, zdalnie

Prof. Davide Bigoni

Instabilities Lab, Università di Trento, Italy

Harnessing structural instabilities to explore material instability

A series of unstable elastic structures exhibiting “exotic” behaviours is presented. These include the inverse Kapitza elastic pendulum [1], tensile buckling [2], Hopf bifurcation induced by a nonholonomic constraint [3], flutter induced by a piecewise-linear constraint [4], folding of an elastic rod [5], and buckling under a transverse uniform load [6]. These structures are then implemented in architected materials, and a rigorous homogenization technique is developed to determine the equivalent elastic continua, whose instability can in turn be analyzed. Using this technique, it is shown that the implementation of follower microforces leads to the realization of an elastic material that breaks the wall of hyperelasticity and is therefore non-Hermitian [7]. Finally, a nonlinear elastic material, derived through the homogenization of structural lattices, is shown to exhibit a rich variety of instability phenomena, including shear-band formation, disappearance, and reappearance, as well as mixed-mode and compaction localization. Remarkably, both classes of material can lose and subsequently recover ellipticity, leading to restabilization of the underlying lattice and even to the emergence of “islands” of stability [8].

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References

- [1] Koutsogiannakis, P., Misseroni, D., Bigoni, D., Dal Corso, F. (2023) Stabilization against gravity and self-tuning of an elastic variable-length rod through an oscillating sliding sleeve. *J. Mech. Phys. Solids*, 181, 105452.
- [2] Fraldi, M., Palumbo, S., Cutolo, A., Bigoni, D. (2023) Bimodal buckling governs human fingers' luxation. *Proc. Natl. Acad. Sci. U.S.A.*, 120(44), e2311637120.
- [3] Cazzolli, A., Dal Corso, F., Bigoni, D. (2020) Non-holonomic constraints inducing flutter instability in structures under conservative loadings. *J. Mech. Phys. Solids*, 138, 103919.
- [4] Rossi, M., Piccolroaz, A., Bigoni, D. (2023) Fusion of two stable elastic structures resulting in an unstable system. *J. Mech. Phys. Solids*, 173, 105201.
- [5] Paradiso, M., Dal Corso, F., Bigoni, D. (2025) A nonlinear model of shearable elastic rod from an origami-like microstructure displaying folding and faulting. *J. Mech. Phys. Solids*, 200, 106100.
- [6] Bigoni, D., Misseroni, D., Piccolroaz, A. (2026) The strange mechanics of an elastic rod under null-resultant transverse loads. *J. Mech. Phys. Solids*, 212, 106590.
- [7] Bordiga, G., Piccolroaz, A., Bigoni, D. (2022) A way to hypo-elastic artificial materials without a strain potential and displaying flutter instability. *J. Mech. Phys. Solids*, 158, 104665.
- [8] Bigoni, D., Piccolroaz, A. (2025) Material instability and subsequent restabilization from homogenization of periodic elastic lattices. *J. Mech. Phys. Solids*, 200, 106129.

Remarks: The seminar will be held online via gotomeeting program under the link: <https://global.gotomeeting.com/join/810943621>