Institute of Thermomechanics, Czech Academy of Sciences

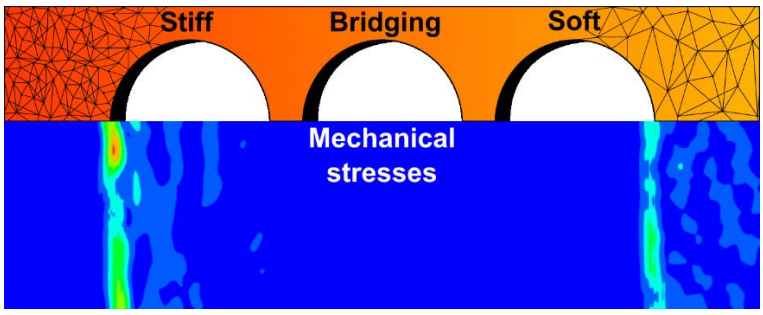
invites you to a lecture within the lecture series **Institute of Thermomechanics Seminar**

How to build a "bridge"?
Nature's strategy for connecting hard and soft materials

given by **Prof. Benny Bar-On**

Department of Mechanical Engineering, Ben-Gurion University of the Negev, Israel

Load-bearing biological materials employ specialized bridging regions to connect material parts with substantially different mechanical properties (hard vs. soft). While such bridging regions have been extensively observed in diverse biomaterial systems that evolved through distinctive evolutionary paths—including arthropod parts, dental tissues, and marine threads—their mechanical origins and functional roles remain vague. In my talk, I introduce a hypothesis that these bridging regions have primarily formed to minimize the near-interface stress effects between the connected material parts preventing their splitting failure, and obtain a simple theoretical law for the optimal mechanical properties of such bridging regions. I demonstrate this principle through Finite-Element simulations and physical experiments on a model synthetic-material system and verify its predictability for different biomaterial systems. The bridging principles of biological materials can be implemented into advanced material designs—paving the way to new forms of architected materials and composite structures with extreme load-bearing capabilities.



Reference: Uzan, A. Y., Milo, O., Politi, Y., & Bar-On, B. (2022). Principles of elastic bridging in biological materials. Acta Biomaterialia, 153, 320-330.

The lecture will be held on Monday, October 2, 2023 at 10:00
in the building of the Institute of Thermomechanics (large lecture room),
Dolejškova 5, 182 00 Prague 8

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