UNIVERSITÀ DEGLI STUDI DI TRENTO

European Research Council
Established by the European Commission

Prof. Davide Bigoni

Solid and Structural Mechanics Group,

Università di Trento

Self-oscillation of elastic systems

Lunedì 14 Novembre, 11:00

Sala Wataghin, Istituto di Fisica, via P. Giuria 1, Torino

contatto: **Federico Bosia (fbosia@unito.it)**

Abstract

Self-oscillation occurs when a periodic motion is spontaneously generated and maintained by a steady (thus lacking periodicity) power source. Examples of self-oscillating phenomena include for instance heartbeat and firing of neurons, but also the oscillatory motion which caused the failure of the Tacoma bridge, and the singing of a water glass when a wet finger is rubbing its rim. Self-oscillation is connected to negative damping or, more in general, to dissipation-induced instabilities. These instabilities have the special feature, often referred as 'paradoxical', that they are promoted, instead than prevented, by dissipation.

We show (both theoretically and experimentally) how to obtain dynamic instability and self-oscillation from dry friction in an elastic mechanical system that would be stable and subject to a purely steady motion in the case of smooth constrains. We provide the first direct experimental proof that viscous damping (in terms of both internal forces and air drag) promotes instability. Finally, the mechanical system designed and realized in our laboratory provides an example where a steady power source can sustain self-oscillation at a tunable frequency and amplitude.

The speaker

Davide Bigoni is Professor of Solid and Structural Mechanics at Department of Civil, Environmental & Mechanical Engineering, University of Trento. He is Principal Investigator of the ERC Advanced grant INSTABILITIES (Instabilities and nonlocal multiscale modelling of materials). A detailed resume of his scientific activity can be found at: www.ing.unitn.it/~bigoni/.