

Seminari

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Dipartimento di Ingegneria Civile, Chimica ed Ambientale - DICCA

Villa Cambiaso - Salone di Rappresentanza - Via Montallegro 1 - Genova

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A Global Dynamics Perspective for the Analysis, Control and Safe Design from Macro- to Nano-Mechanics



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Abstract

The lecture will open with a classification of its main theme within some main stages of developments of nonlinear dynamics in solid/structural mechanics, as occurred over the last forty years. Then, it will focus on highlighting the important role played by global analysis in unveiling the nonlinear response and the actual safety of engineering systems in different environments. Reduced order models of macro/micro-structures will be considered.

A laminated plate with full thermomechanical coupling will allow to discuss the meaningful transient effects entailed by thermal excitations on the steady mechanical response. An atomic force microcantilever will be referred to for highlighting the severe worsening of overall stability associated with the application of an external feedback control, and the importance of global dynamics for conceiving and effectively implementing a control procedure aimed at enhancing engineering safety.

The last part of the talk will dwell generally on the role that a global dynamics perspective is expected to play in the near future on the safe design of real systems, focusing on how properly exploiting concepts and tools of dynamical integrity to evaluate response robustness in presence of unavoidable imperfections, and to control/improve load carrying capacity.

C.V.

Giuseppe Rega has been a Professor of Solid and Structural Mechanics at Sapienza University of Rome. He taught to students in Civil and Mechanical Engineering, and Architecture, where he established an innovative Master Degree in Structural Design and Rehabilitation. He is Chairman of the EUROMECH Nonlinear Oscillations Conference Committee, Italian Representative at IUTAM General Assembly, Member of Scientific Council of CISM. Past President of AIMETA, he was Chairman of Sapienza Ph.D. School in Structural and Geotechnical Engineering, Chairman of the Committee of Italian Professors of Solid and Structural Mechanics, Head of Department of Structure, Water and Soil Engineering of University of L'Aquila.

Past Editor-in-Chief of *Meccanica*, has been/is Associate Editor or Advisor/Editorial Board Member of several Archival Journals. Organized many scientific events within EUROMECH, IUTAM, ASME, NNM, CISM, EUROLYN and other societies. Plenary/Keynote Lecturer at a huge number of international conferences and many academic institutions.

He was the (first non-anglosaxon) recipient of the ASME Lyapunov Award (2017). His birthday anniversary was honored with Special Issues of *Nonlinear Dynamics* (60th) and *Int. J. Non-Linear Mech.* (70th). Published about 150 papers in more than 50 Archival Journals, 70 Edited Volume Chapters, and nearly 100 Refereed Conference Proceedings Papers. Edited 4 Books and 7 Archival Journals Special Issues.

GR has provided contributions to nonlinear dynamics, including cable dynamics, nonlinear oscillations, bifurcation and chaos in applied mechanics and structural dynamics (from macro- to micro-scale), reduced-order modelling, control of oscillations and chaos, exploitation of global dynamics for engineering safety, smart materials, coupled oscillators, thermomechanical problems, by using the combination of analytical, computational, geometrical, and experimental techniques needed to reliably detect and characterize the variety of nonlinear/complex dynamic phenomena possibly occurring in different engineering areas. Has also been active in structural architecture.