

HIGHLIGHTS OF TWENTY YEARS OF RESEARCH IN MECHANICS

talk by **Gustavo Gioia**

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ABSTRACT

In this talk I outline the outcome of research on three themes in the **mechanics of solids and fluids**. The first theme may be termed "**bistable material systems**" and encompasses phenomena such as the buckling of thin elastic films, the deformation of elastic cellular materials, and the compaction of cohesive granular aggregates. The second theme, "**dense granular flow**," concerns phenomena such as stratification, diffusion, segregation, and crater-ray formation in flowing granular systems. The third and last theme, "**the spectral link in turbulence**," is named after a simple model whereby turbulent phenomena such as the frictional drag and the mean-velocity profile, which are discussed in any undergraduate textbook on fluid dynamics but remain poorly understood, can be linked to, and explained as macroscopic manifestations of, the classical turbulent-eddy velocity distribution of Kolmogorov. The talk dwells on the physical phenomena (as evinced in experiments) and on salient theoretical concepts (excluding technicalities); it is meant for general engineering students who might be interested in research.

SHORT BIO

Gustavo Gioia is a professor of continuum physics at the **Okinawa Institute of Science and Technology Graduate University**, Japan. He was formerly affiliated with the College of Engineering, University of Illinois at Urbana-Champaign, where he served as assistant professor (2000-2006) and associate professor (up to 2011). He held postdoctoral positions at the University of Minnesota and at Rutgers University, received graduate degrees from Brown University (PhD, solid mechanics) and Northwestern University (MSc, theoretical and applied mechanics), and his undergraduate degree from the University of Buenos Aires (diploma, structural engineering). He is interested in the mechanics of fluids and solids (<https://groups.oist.jp/cpu/gustavo-gioia>).



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