Tata Institute of Fundamental Research
Hyderabad

Colloquium

Itamar Procaccia
Weizmann Institute of Science, Israel

Professor Itamar Procaccia is world renowned scientist who has made contributions to areas in statistical physics, nonlinear dynamics, and turbulence.

Dr. Procaccia is a pioneer in the interdisciplinary field of chaos research. He introduced the correlation dimension as a measure of fractal dimension along with Peter Grassberger, in 1983 (Grassberger–Procaccia algorithm).

He was an UNESCO Professor of Science and Sustainable Development for Latin America (1995-2000) and is fellow of the American Physical Society, the Institute of Physics. He is also a member of the Leopoldina, the German National Academy of science, the Danish Royal Academy of Arts and Sciences and the Academia Europaea. Grande Ufficiale dell'Ordine della Stella della Solidarieta' Italiana, The Grand Star of the "Order of Scientific Merit" of the Federal Republic of Brazil, the Israel Prize for physics in 2009 and the EPS Statistical and Nonlinear Physics Prize in 2017 are among the many prestigious honours & awards he has received. At present, he is the Barbara and Morris L. Levinson Professorial Chair in Chemical Physics at the Weizmann Institute of Science, Israel.

Mechanical Failure in Amorphous Solids: Scale Free Spinodal Criticality

The mechanical failure of amorphous media is a ubiquitous phenomenon from material engineering to geology. It has been noticed for a long time that the phenomenon is "scale-free", indicating some type of criticality. In spite of attempts to invoke "Self-Organized Criticality", the physical origin of this criticality, and also its universal nature, being quite insensitive to the nature of microscopic interactions, remained elusive. Recently we proposed that the precise nature of this critical behavior is manifested by a spinodal point of a thermodynamic phase transition. Demonstrating this requires the introduction of an 'order parameter' that is suitable for distinguishing between disordered amorphous systems. At the spinodal point there exists a divergent correlation length which is associated with the system-spanning instabilities (known also as shear bands) which are typical to the mechanical yield. The theory, the order parameter used and the correlation functions which exhibit the divergent correlation length are universal in nature and can be applied to any amorphous solid that undergoes mechanical yield.

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All are welcome

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