Winter 2024 Joint Colloquium
Materials Department & Materials Research Laboratory

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Elasto-plastic stochasticity: the role of atomic level fluctuations on mesoscale deformation properties in complex alloys

Abstract:

Materials deformation is ultimate controlled by physical processes at the atomic scale. In many cases, these processes are controlled by fluctuations characterized by highly stochastic behavior. While we have learned to subsume this stochasticity into continuum laws that describe average behavior, as science and technology pushes down the boundaries of what is observable in terms of time and length scales, the mean field approach becomes to be questionable. Specifically, important phenomena in metals deformation such as creep, dynamic strain aging, solute hardening, and deformation processes in chemically complex alloys cannot be properly studied without capturing atomic-level fluctuations and their effect on meso/macroscopic behavior. In this presentation, I will discuss the development of models that take into account thermal and compositional fluctuations explicitly and how their results can be extended into larger length and longer time scales. Results for refractory transition metals, ferritic materials, and high-entropy alloys will be shown.

Bio:

Prof Jaime Marian has a joint appointment in the Materials Science and Engineering and Mechanical and Aerospace Depts. at UCLA since 2014. Prior to that, he was a staff scientist at Lawrence Livermore National Laboratory, where he worked on the development of physics models for materials under extreme conditions. He holds an industrial engineering degree from the Polytechnic University of Madrid, and a PhD in computational materials and mechanics. He did postdoctoral work at Caltech and was visiting professor at the IMDEA Materials Institute in Madrid.

Hosted by Ananya Renuka Balakrishna