

LMS Seminar

Self-similar metamaterials with spatial and temporal hierarchy

Minh-Son Pham

Imperial College London

Date, time, and venue

April 3, 2026 (2 – 3 pm), Amphithéâtre Pole Mecanique

Abstract

Meta-materials can achieve new properties thanks to precisely engineering the architecture of internal structures (i.e. meta-structuring) to deliberately control/interact with external signals such as electromagnetic or elastic waves. In contrast, the metallurgical approach focuses on engineering the natural crystals' intrinsic microstructure, allowing us to develop metallic alloys with excellent properties and mechanical performance beyond what can be obtained by the alloy composition. Recent advances in material processing, including additive manufacturing, enable precisely structuring both the metallurgical features (from the chemical composition to phases and crystallographic orientations) and internal physical structures (i.e. meta-structures) to specific locations, providing opportunities to go beyond the meta-structuring. In this talk, I will present an innovative way that synergistically combines the meta-structuring and metallurgical microstructuring together to create a new class of meta-materials with spatial hierarchy (i.e. self-similar structures) and temporal hierarchy (multi-scale transformation) to program the mechanical properties including on-the-fly reconfiguration in response to external conditions.

About the speaker

Dr. Minh-Son Pham is an associate professor (Reader level) in Engineering Alloys at Imperial College London, and currently leads a dynamic research group focusing on alloy design, mechanical metamaterials, additive manufacturing, and mechanical integrity. His excellent track record in research includes \approx 45 peer-reviewed publications (including in Nature), and \approx 15 plenary/keynote and invited talks at major international conferences and meetings (e.g., TMS2024 Special Lecture, Additive Manufacturing International, and MRS conferences). His research has been recognised via series of accolades awarded in the UK, USA and Switzerland including the ETH Medal 2013 and the TMS Young Innovator Award 2024 in Materials Science for Additive Manufacturing. Dr. Pham has established extensive collaboration with leading academics and industrial experts (Rolls Royce, EDF, ESA and Cross Manufacturing) to tackle engineering challenges in energy, automobiles, aerospace and medical devices. He authors two patents and is a co-founder of a spin-off healthcare company (with medical doctors in Hammersmith, London).

