

## MM 9: Invited talk Ponson

Time: Monday 15:00–15:30

Location: TC 006

**Invited Talk**

MM 9.1 Mon 15:00 TC 006

**Deciphering fracture patterns: what crack paths teach us about the mechanics and physics of fracture** — •LAURENT PONSON — Institut Jean le Rond d'Alembert, CNRS, Paris - France

Cracks follow intriguing trajectories that seem to hide a mysterious secret. Ancient Chinese civilization interpreted the tortuous path of cracks in turtle shells as an oracle to foresee the future. Nowadays, fractography, the study of fracture surfaces, is a broadly used engineering technique that aims at tracing back the history of a failure and determining its root causes. For 30 years, the study of fracture patterns has taken a new turn: could we learn from the morphology of cracks the fundamental laws of fracture? During this presentation, I will present some remarkable advances in the understanding of fracture

patterns and I will explain how they challenge the current theory of fracture and, in fine, contribute to improve it. I will first discuss how to decipher triangular patterns observed on fracture surfaces of polymeric solids and why it contributed to understand on how tensile cracks behave in presence of shear. Then, I will focus on crack roughness that is the fingerprint of the interaction of cracks with the microstructure of materials. I will present how their statistical properties reveal basic crack growth mechanisms, leading us to revisit, and even reconcile, the concepts of ductile and brittle failure. Last but not least, I will discuss some implications for engineering sciences. Even though the analysis of fracture patterns still does help to foresee the future, it can now be used to trace back the history of the failure and characterize material properties with unprecedented accuracy and reliability.