A self-healing, adaptive, hierarchical material - Prof. Davide Ruffoni, Universté de Liege

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Damage and failure in ductile metals is characterized by nucleation, growth, and coalescence of voids. The underlying mechanisms and kinetics that control void nucleation and growth have been linked to material microstructure, but the specific controlling mechanisms associated with these processes are not understood or predicted. Hence, it is impossible to quantitatively understand and develop the physics that addresses basic questions like "how do materials fail?" This lack of understanding is in part related to a deficiency in experimental techniques that allow for direct quantitative and statistically relevant observations of void nucleation and early-stage growth. These in-situ observations have long remained a grand experimental challenge, largely due to the extremely fine spatial (nm) and narrow temporal (fs-ns) scales involved during actual loading experiments. In this talk, we will discuss examples where failure in metals is investigated using spall recovery techniques and advanced light sources like the advanced photon source and proton radiography