

## ON THE OPERATIONAL REGIMES OF DEFORMATION IN MATERIALS

*Neil Bourne<sup>1</sup>  
Jeremy Millett<sup>1</sup>*

### **Abstract**

Materials respond to dynamic loading with a variety of mechanisms. Each has its own mechanical threshold for operation including discrete stress levels and times. When a material is exposed to extremes of pressure such mechanisms include martensitic phase transformation, dislocation nucleation and propagation, twinning and potentially melting. The mechanical environment and the thermodynamics of the mechanisms determine the kinetics and the effect upon the microstructure. Examples are drawn from a variety of metallic responses showing the suite of available mechanisms and the range of observables that results. The ordering is shown around particular scales and times and these will be enumerated and effects presented to show that natural mechanical thresholds exist for materials response.

<sup>1</sup> AWE.