**Large-strain elasto-plasticity driven by dislocation movement**

In this talk I will presents a recent "space-time" approach to the movement of (discrete) dislocations in single crystals and I will explain how this framework can be used to formulate the system of rate-independent (quasi-static) large-strain elasto-plastic evolution driven by dislocation flow. This modelling approach is built on the concept of space-time "slip trajectories", that is, the 2-dimensional surfaces traced out by the dislocations as time progresses. All relevant quantities (Burgers vector, slip velocity, dislocation orientation, etc.) can be computed from the space-time formulation in a straightforward way, which is the key to directly couple the dislocation dynamics to plastic flow. This modelling can be made mathematically rigorous using the theory of Federer-Fleming integral currents, furnishing a "weak formulation" of the equations describing dislocation motion, and enabling the proof of an existence theorem for the corresponding large-strain elasto-plastic evolution. This is joint work with T. Hudson (Warwick).