Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

A Dynamic Discrete Dislocation Plasticity Method for the Dimulation of Plastic Relaxation under Shock Loading[1] BENAT GURRUTXAGA-LERMA, Centre for Doctoral Training in Theory and Simulation of Materials, Imperial College London, ADRIAN P. SUTTON, DANIEL E. EAKINS, Department of Physics, Imperial College London, DANIEL S. BALINT, DANIELE DINI, Department of Mechanical Engineering, Imperial College London — This talk intends to offer some insight as to how Discrete Dislocation Plasticity (DDP) can be adapted to simulate plastic relaxation processes under weak shock loading and high strain rates. In those circumstances, dislocations are believed to be the main cause of plastic relaxation in crystalline solids. Direct simulation of dislocations as the dynamic agents of plastic relaxation in those cases remains a challenge. DDP, where dislocations are modelled as discrete discontinuities in elastic continuum media, is often unable to adequately simulate plastic relaxation because it treats dislocation motion quasi-statically, thus neglecting the time-dependent nature of the elastic fields and assuming that they instantaneously acquire the shape and magnitude predicted by elastostatics. Under shock loading, this assumption leads to several artefacts that can only be overcome with a fully time-dependent formulation of the elastic fields. In this talk one of such formulations for the creation, annihilation and arbitrary motion of straight edge dislocations will be presented. These solutions are applied in a two-dimensional model of time-dependent plastic relaxation under shock loading, and some relevant results will be presented.

[1]EPSRC CDT in Theory and Simulation of Materials

Benat Gurrutxaga-Lerma
Centre for Doctoral Training in Theory and Simulation of Materials,
Imperial College London

Date submitted: 26 Feb 2013 Electronic form version 1.4