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Report on one-day symposium on:

Dislocations and high rate properties of metals

July 20 2018

*The Maxwell Centre, Cavendish Laboratory, Cambridge CB3 0HE*

This symposium was organised with the aim of enabling a number of speakers interested in elevated strain rates but *researching* in different fields come together to present and discuss their findings.

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The list of lecturers and lectures were:

**Mick Brown** (Cavendish Laboratory, Cambridge)

*Ellipsoids: Collective motion of dislocations and rate dependence*

**Mick Brown** (Cavendish Laboratory, Cambridge) [presenting on behalf of Lewis Lea]

*Structural evolution in the dynamic plasticity of fcc metals*

**Phil Church** (QinetiQ)

*Overview of metal constitutive modelling in QinetiQ*

**Beñat Gurrutxaga-Lerma** (Engineering Department, Cambridge University)

*Dislocations in shock*

**Bill Proud** (Institute of Shock Physics, Imperial College)

*Shock properties of metals*

**Fred Coghe** (Royal Military Academy, Brussels)

*Metallurgy of metallic armour systems*

**Rong Yang** (Institute of Nonlinear Mechanics, Beijing)

*Dynamic properties of granular metals*

**Tom Childs** (University of Leeds)

*Modelling chip formation in metal cutting: The case of carbon and low alloy steels*

The four morning lectures were predominantly theoretical. The papers by Mick Brown described the collective motion of dislocations and the evolution of structure in dynamic plasticity. Phil Church presented a paper on constitutive modelling at QinetiQ in which he described the importance of Goldthorpe’s work on the understanding of the onset of localisation and the beginning of plastic deformation. Beñat Gurrutxaga-Lerma described his research on the nucleation of dislocations by the passage of shock waves.

After a sandwich lunch break there were four lectures on predominantly practical topics. Bill Proud presented research regarding the shocking of single crystals of magnesium, with a discussion on the extent of twinning in shocked specimens. Fred Coghe’s talk focussed on the applications of materials research, demonstrating the materials selection processes for a range of armour systems (with a particular note to cost as well as functionality!). Rong Yang outlined a novel experimental method for directly measuring temperature in granular metals using a high-speed IR camera, and finally Tom Childs highlighted modelling approaches to chip formation in machining – noting a need for improved understanding of the behaviour of metals deformed to very high strains.

Although these were widely disparate (though related) topics, each led to valuable and sometimes lengthy discussions. It is rare to see a conference where everything from first-principles material modelling to final real-world application, via novel experimental techniques, is discussed in a single room on a single day – but the response from attendees suggests that this was a fruitful approach and the conference was a worthwhile endeavour. The number of participants being a modest 23, along with time for substantive discussion between talks, was noted by several of those attending as key to the success of the meeting.

*Participants:*

Chris Braithwaite (Cavendish Laboratory), Mick Brown (Cavendish Laboratory), Tim Cartwright (AWE), Tom Childs (Leeds University), Phil Church (QinetiQ), Fred Coghe (Royal Military Academy, Brussels), Mike Cox (AWE), James Dear (Imperial College, London), John Dear (Imperial College, London), Bradley Dodd (Imperial College, London), Beñat Gurrutxaga-Lerma (Cambridge University Engineering Department), Paul Hooper (Imperial College, London), Xiaochen Lu (Imperial College, London), Hugh MacGillivray (Imperial College, London), James Perry (Cavendish Laboratory), Bill Proud (Imperial College, London), Robert Quinn (Imperial College, London), Clive Siviour (Department of Engineering Science, Oxford), David Townsend (Department of Engineering Science, Oxford), Stephen Walley (Cavendish Laboratory), Sarah Ward (Cavendish Laboratory), David Williamson (Cavendish Laboratory), Rong Yang (Institute Nonlinear Mechanics, Beijing)

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