# SEMINARIO DE OPERADORES Y FÍSICA-MATEMÁTICA

Organizers: *Doctors: Rafael del Río, Luis O. Silva and Ricardo Weder*

## A MATHEMATICAL STUDY OF MODELS FOR DISLOCATION MOTION

**Dr. Thomas Hudson**
University of Warwick

**Abstract**

Dislocations are topological line defects found in crystals, and their motion governs the plastic properties of such materials. Due to the long-range stress fields they induce, their collective behaviour is highly complex. Understanding this behaviour (and thus obtaining improved predictive models of plasticity) remains a major challenge in Materials Science. A popular simulation technique used by Materials Scientists to answer questions in this direction is Discrete Dislocation Dynamics (DDD): this involves evolving dislocation lines according the stress field in the crystal in order to extract macroscopic properties. This talk presents a series of mathematical results concerning the rigorous justification of DDD from a microscopic model, as well as ongoing work concerning the convergence of numerical algorithms used to simulate DDD.

*22 de junio de 2017*

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## BOUNDARY HILBERT SPACES AND QUANTISATION OF FIELD-PARTICLE COMPOSITE SYSTEMS

**Dr. Benito Alberto Juárez Aubry**
Instituto de Ciencias Nucleares, UNAM

**Abstract**

We show how to associate natural boundary Hilbert spaces to the quantisation of classical systems in bounded regions that can be understood as composite boundary-bulk systems. As an example, we will show in detail how one can Fock quantise a linear field-particle interacting system consisting of a string with two point masses attached at the ends. We shall see that, although the quantised system cannot be immediately decomposed as a tensor product of 'masses' and 'string' Hilbert spaces, there is a natural Hilbert space that can be associated to the boundary with the aid of so-called trace operators from PDE theory.

*5 de diciembre de 2017*