Universidad Carlos III de Madrid
Department of Mathematics

# COLLOQUIA

## Tuesday, October 14, 2014.


## Mathis Plapp (École Polytechnique, Palaiseau, France)


# Phase-field methods for free-boundary problems: applications to microstructure formation in materials


**Abstract:**

The properties of a material are often largely influenced by its microstructure. Therefore, the prediction of the microstructure as a function of the processing conditions is an important task. Microstructures are generally formed out of equilibrium and result from spontaneous self-organization processes that involve moving interfaces and grain boundaries. A complete understanding of microstructure formation therefore requires to follow this complex interface dynamics and the resulting structure evolution. In recent years, the phase-field method has emerged as a method of choice for the numerical modelling of such free-boundary problems. It is based on phenomenological equations of out-of-equilibrium thermodynamics that are combined with free-energy functionals of Ginzburg-Landau type; interfaces are represented implicitly by profiles of suitable order parameters. Using relatively simple codes, microstructure evolution can be simulated qualitatively, and for some cases even quantitatively. I will first give an introduction to the principles of this method, taking as an example the growth of dendrites during solidification, and then discuss other applications to structure formation in hard and soft matter systems.


**Univ. Carlos III de Madrid**

**Default Data**

**Time** 11:00 to 12:00
**Location** Room 2.2.D08
Building Sabatini (2nd Floor)

**Address**

Avda. de la Universidad 30
28911, Leganés, Madrid

**Department of Mathematics**