

# THE CRM APPLIED MATHEMATICAL AND PHYSICS (CAMP) SEMINARS



CENTRE DE RECERCA MATEMÀTICA

Francesc Font Martínez

*Centre de Recerca Matemàtica*

## Mathematical modelling of special solid-liquid phase transitions

### Abstract:

Part I: Materials made from supercooled melts can have markedly different properties to the standard form of the material. Such materials are currently used in medicine, defence, electronics and sports. The solidification of these melts can be modelled by means of the supercooled Stefan problem (SSP) with a variable phase change temperature ( $T_f$ ). Previous works in the topic assume a linear relation between  $T_f$  and the velocity of the freezing front ( $v$ ). In this part of the talk, I present solutions for the SSP with a more physically realistic nonlinear relation between  $T_f$  and  $v$ .

Part II: Nanoparticles have generated tremendous interest in the scientific community in the last few decades: they exhibit unique optical, electrical, and magnetic properties not seen at the bulk scale. These properties and their size make them attractive for industrial and biomedical applications.

One form of application, based on the melting process of nanoparticles, is used in drug delivery or microelectronics. In this part of the talk, we present a mathematical model describing the melting of nanoparticles that takes into account the Gibbs-Thomson effect and the thermal expansion of the nanoparticles, which turn out to be non-negligible at that scale. The melting times obtained from our results are in good agreement with experimental observations.

<b>Date:</b>	<b>November 28, 2013</b>
--------------	--------------------------

<b>Place:</b>	<b>Room C1/028</b>
---------------	--------------------

<b>Time:</b>	<b>12:00</b>
--------------	--------------

