CRM APPLIED MATHEMATICAL PHYSICS (CAMP) SEMINARS

CENTRE DE RECERCA MATEMÀTICA

Prof. Scott McCue

Queensland University of Technology

Similarity solutions of a nonlinear diffusion equation with an application to cell migration assays

The porous medium equation (PME) is a second-order nonlinear degenerate diffusion equation that has many applications in the physical sciences, but is also of some interest in mathematical biology. In many modelling scenarios, the PME is attractive because it allows for sharp-fronted solutions with compact support, whereas the linear diffusion equation does not. It is well known that the PME has similarity solutions of the first kind which conserve mass and act as asymptotic solutions to the initial-value problem in the large-time limit. In contrast, hole-closing problems for the PME, for which the initial conditions are identically zero within a compact domain, are characterised by similarity solutions of the second kind, as conservation of mass no longer applies. Here the similarity solutions are relevant in the limit that the hole closes. I will summarise these issues and discuss how the PME and related reaction diffusion equations can be used to model cell migration experiments such as scratch assays, barrier assays and other wound healing assays.

Prof. Mark McGuinness

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Crackling volcanic bombs

A Surtseyan eruption is a particular kind of volcanic eruption which involves the bulk interaction of water and hot magma, mediated by the return of ejected ash. Surtsey Island, off the coast of Iceland, was born during such an eruption process in the 1940s. Mount Ruapehu in New Zealand also undergoes Surtseyan eruptions, due to its crater lake. One feature of such eruptions is ejected lava bombs, trailing steam, with evidence that watery slurry was trapped inside them during the ejection process. Simple calculations indicate that the pressures developed inside such a bomb should shatter it. Yet intact bombs are routinely discovered in debris piles. In an attempt to crack this problem, I will talk about a transient mathematical model of the flashing of water to steam inside one of these hot erupted lava balls.

Date:	**July 23, 2019**
Place:	**Room C1/028**
Time:	**12:00**