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Friday, October 1, 2010
3:00 p.m.
CAB 373

"Cell Adhesion and Re-organisation in a Multiphase Model Describing Tumour and Tissue Growth"

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Abstract

The main aim of the talk is to describe how to embed the experimental results recently obtained studying the detachment force of single adhesion bonds in a multiphase model developed to describe the growth of tumours and tissues in general. In order to do that the microscopic information is upscaled to the macroscopic level to describe the dependence of some crucial terms appearing in the PDE model on the sub-cellular dynamics involving, for instance, the density of bonds on the membrane, the probability of bond rupture and the rate of bond formation. In fact, adhesion phenomena influence both the interaction forces among the constituents of the mixtures and the constitutive equation for the stress of the cellular components. Studying the former terms a relationship between interaction forces and relative velocity is found. The dynamics presents a behaviour resembling the transition from epithelial to mesenhymal cells or from mesenchymal to ameboid motion though the chemical cues triggering such transitions are not considered here. The latter terms are dealt with using the concept of evolving natural Configurations consisting in decomposing in a multiplicative way the deformation gradient of the cellular constituent distinguishing the contributions due to growth, to cell rearrangement and to elastic deformation. This allows to describe situations in which if in some points the ensemble of cells is subject to a stress above a threshold, then locally some bonds may break and some others may form, giving rise to an internal re-organisation of the tissue that allows to relax exceedingly high stresses.

Refreshments will be served in CAB 649 at 2:30 p.m.