Multiscale Modelling of Cell-ECM Interactions
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Cell-extracellular matrix interaction and the mechanical properties of cell nucleus have been demonstrated to play a fundamental role in cell movement across fibre networks and micro-channels. In the talk, I will describe several mathematical models dealing with such a problem, starting from modelling cell adhesion mechanics to the inclusion of influence of nucleus stiffness in the motion of cells. An energetic approach is used in order to obtain a necessary condition for which cells enter cylindrical structures. The nucleus of the cell is treated eitheras an incompressible elastic material with Neo-Hookean constitutive equation. The results obtained highlight the importance of the importance of the mechanical deformability of the nucleus and the capability of the cell to establish adhesive bonds in penetrating microchannels.
This knowledge is finally used in multiphase model to describe the segregation of cell aggregates by the extracellular matrix