For all students and Staff

15 November 2006 17:00
Lecture Theatre 1,
Ken Edwards Building

Distinguished Lecture

Lattice Boltzmann at all-scales: from turbulence to DNA translocation

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The lattice Boltzmann (LB) method was developed nearly two decades ago as an alternative strategy for the numerical solution of the Navier-Stokes equations of fluid dynamics. By and large, this task has met with significant success, to the point that, as of today, LB is routinely used for the numerical investigation of a wide range of macroscopic flows, from multiphase flows in porous media, to fully-developed turbulent flows in complex geometries.

In the recent years, significant efforts have been directed towards the development of a new generation of LB schemes capable of dealing with flows at the micro and nanoscale. This entails a number of challenges, on both theoretical and computational fronts. Although much remains to be done, the successful handling of these challenges is turning LB into a simulational strategy capable of dealing with fluid flow at-all scales, from macroscopic turbulence all the way down to nanoscopic flows of biological interest.

In this Lecture, after a brief review of the basic ideas behind the LB theory, we shall discuss these ongoing developments, and present some very recent applications to micro and nanofluidics, such as drag reduction via superhydrophobicity and hydrodynamic effects on DNA translocation.

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