

An Indian-Australian research partnership

## Flow based micro-devices for DNA manipulation and analysis

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### The project

The project involves experimental and theoretical studies aimed at designing prototypical geometries for microfluidic devices, and the development of an efficient computational method for predicting the behaviour of DNA in these devices. Experiments will focus on direct visualization of the conformations of DNA in a series of specially fabricated micro-devices. A careful characterization of the equilibrium properties of DNA molecules under various conditions will also be carried out. Theoretical efforts will be directed at developing numerical methods, based on Brownian dynamics and Lattice-Boltzmann simulations, which are capable of accurately describing DNA-flow interactions and the interaction of DNA with confining walls. The algorithms will also be able to deal with complex geometries. The experiments and computations will together lead to an understanding of the fundamental principles and mechanisms of macromolecular interaction with flow, and will provide a basis for the design and fabrication of microfluidic devices for handling DNA and other bio-macromolecules. It is anticipated that in the future, flow induced nucleic acid analysis will provide an economical and faster alternative to other methods, and serve as a viable technique for diagnostic bio-medical devices.