TIFR Centre for Interdisciplinary Sciences
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Seminar

Programming non-equilibrium chemical dynamics with DNA strand displacement cascades

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What separates "life" from "matter"? One perspective could be that life is matter embedded with sophisticated algorithmic control. Indeed, living systems use non-equilibrium chemical dynamics to implement and execute such algorithms for controlling physical processes (eg. the cell cycle). Therefore, understanding how to engineer dynamic chemical systems seems to be a necessary prerequisite for the long-term goal of designing and fabricating biochemical systems comparable to life in complexity.

In this talk I will describe our efforts to program complex chemical dynamics using synthetic DNA as an engineering material. In essence, given a set of chemical reaction equations and rate constants, which specify a prescribed dynamic behavior, we exploit a simple motif called DNA strand displacement to engineer a sequence of reaction cascades that, under certain conditions, can be shown to approximate the prescribed dynamic behavior. As a test case, I will describe our experimental efforts towards (and challenges in) engineering a chemical oscillator from scratch.

Thursday, May 1st 2014

11:30 AM (Tea/Coffee at 11:15 AM)

Seminar Hall, TCIS