INTERNATIONAL SOLVAY INSTITUTES BRUSSELS

2016 International Solvay Chair in Chemistry
Inaugural Lecture

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Molecular Machines and Synthetic Motors: Active Motion on the Nanoscale

Molecular machines operate far from equilibrium and are subject to strong thermal fluctuations. They use chemical energy to perform a variety of tasks, acting as motors, enzymes or pumps, and in doing so play important roles in the operation of the cell. Synthetic chemically-powered nanomotors, with and without moving parts, operate under similar conditions and are being studied because of their potential applications involving active transport on small scales and the challenges they pose for theory and simulation. Two examples will be used to illustrate the phenomena that such systems display: synthetic chemically-powered nanomotors and hydrodynamic collective effects arising from active protein machines. The kinds of synthetic nanomotors that have been constructed and their potential applications will be described, and the mechanisms they use for propulsion and how their dynamics may be simulated will be discussed. Experimental observations have shown that transport in the cell is influenced by protein activity. It will be shown that one mechanism that may contribute to the enhanced transport of passive particles and other enzymes in the cell and in solution is due to the hydrodynamic flows that are generated by the nonequilibrium conformational changes of active enzymes.

Tuesday 19 April 2016 at 4.00 P.M.

COFFEE AND TEA WILL BE SERVED AT 3.45 P.M. IN FRONT OF THE SOLVAY ROOM
DRINKS AT 5.00 P.M. IN FRONT OF THE SOLVAY ROOM

SOLVAY ROOM
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