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Designing novel nanoscale motors

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Nature has evolved incredibly powerful nanoscale machines, dubbed molecular motors, which are capable of working in the very thermally noisy environment of a cell. These naturally occurring motors have surprisingly high efficiencies and can transport cargo in specific directions at high speeds. How well do we understand the principles by which these operate? Can we take advantage of what is known about these principles in order to design and build novel nanoscale devices? In this talk, I will outline some of the impressive properties of biological molecular motors. We will then think about how we might design a motor, from scratch, that is capable of unidirectional transport, and what parameters are important in its function. I'll present some of our computer simulations of synthetic molecular motors, and describe progress towards their experimental realization. Work carried out in collaboration with Martin J. Zuckermann, Suzana Kovacic and Laleh Samii (Simon Fraser University), Elizabeth H.C. Bromley (Durham University), Derek N. Woolfson (University of Bristol), Paul M.G. Curmi (University of New South Wales) and Heiner Linke (Lund University).