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Molecular Motors from DNA

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DNA is a wonderful material for nanoscale construction: its self-assembly can be programmed by making use of its information-carrying capability and its hybridization or hydrolysis can be used as to provide energy for synthetic molecular machinery. With DNA it is possible to design and build three-dimensional scaffolds, to attach molecular components to them with sub-nanometre precision–and then to make them move. I shall describe our work on autonomous, biomimetic molecular motors powered by chemical fuels and the use of synthetic molecular machinery to control covalent chemical synthesis. I shall demonstrate bipedal motors whose operation depends on the coordination of the chemomechanical cycles of two separate catalytic centres and burnt bridges motors that can be programmed to navigate networks of tracks. I shall also discuss the use of kinesin motor proteins to power synthetic devices.