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Hexameric DNA-based motor proteins

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Hexameric, ring-shaped motor proteins play important roles in a wide variety of cellular processes. They typically encircle a nucleic acid or protein substrate in order to perform a mechanical activity. Motivated by a desired to understand the advantages and peculiarities of this strikingly symmetric design, we have performed single-molecule measurements of several different DNA-based hexameric motors. I will discuss how, for the bacterial protein FtsK, the hexameric structure causes an anomalous coupling between rotation and linear motion. I will also present recent results in which we exploit the ability of certain hexameric helicases to encircle either single or double-stranded DNA in order to probe their activity in several different ways. Where relevant, I will introduce the novel magnetic-tweezer based measurement techniques we have devised for these experiments.