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Exact results for currents in nonadiabatic stochastic pumps JORDAN HOROWITZ, University of Maryland — Biological systems abound with examples of molecular machines: assemblies of molecules that perform specific useful mechanical tasks, such as the motor proteins kinesin and myosin. Remarkably, the first steps in developing useful artificial molecular motors have been taken with the synthesis and manipulation of molecular complexes such as catenanes and rotaxanes. These developments have spurred an interest in developing theoretical frameworks which describe these mesoscopic machines that operate in the presence of thermal noise. In this talk I will analyze a generic model of molecular machines known as stochastic pumps in which useful directed motion (or current) is produced by the variation of external parameters. The main result is an exact expression for the current in the presence of nonadiabatic pumping. This expression connects to a variety of results from the field of brownian ratchets and leads to a surprising "no-pumping" theorem: a set of conditions that guarantee no excess or pumped current. These predictions also agree with the observations on catenanes, interlocked ring molecules, made by Leigh et. al. [Nature, 424, 174 (2003)].

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