[P11] Work fluctuations for a colloidal particle in a time-varying optical trap in analogy with gas in expansion and compression

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The fluctuation theorem provides a rigorous statistical rule for thermally fluctuating quantities such as work, heat, and entropy production in nonequilibrium thermodynamic processes. However, testing the theorem needs small systems where the fluctuations are more observable. Therefore, there are great difficulties in the experimental measurements. In this work, we investigate the motion of a colloidal particle trapped in a harmonic potential with time-varying stiffness. Here, we estimate the work done on the particle during compression and expansion by measuring its particle position in the first time. The resultant probability distributions of the work in both processes satisfy very well the Jarzynski equality and the Crooks fluctuation theorem. Because this isothermal expansion and compression process in a soft wall qualitatively mimics that in a rigid wall, it offers valuable tool for extracting work from micromechanical heat engines.