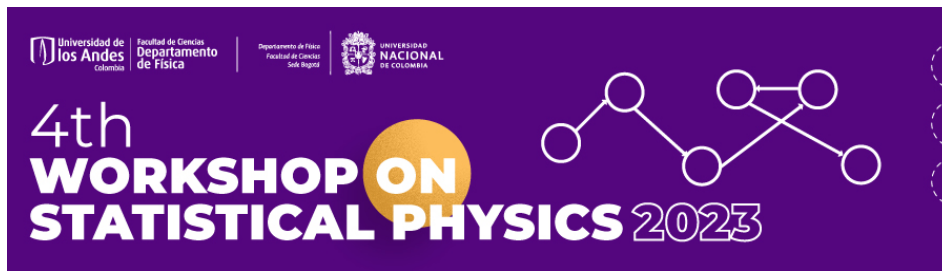


4th Workshop on Statistical Physics



Contribution ID: 2

Tipo: **Invited talk**

What can Maxwell's demon do?

viernes, 6 de octubre de 2023 8:30 (30 minutos)

Information engines are a modern realization of the Maxwell-demon thought experiment. They exploit “favorable fluctuations” of a heat bath to generate work, at the cost of dissipation in a measuring device. Experimental tests of these engines require accurate measurements and fast feedback control. We designed a simple information engine using optical tweezers and feedback to raise a micron-sized trapped bead diffusing in water — a heavy mass — against gravity, without doing any external work. We first explore the conditions that maximize engine performance and achieve powers (~ 1000 kT/s) and speeds (~ 190 $\mu\text{m/s}$) that compare to bacteria, which have a similar size. We then show that naively implemented information engines fail to function when measurements are too noisy but that more sophisticated measurement “filters” can provide good performance, even when measurement noise is comparable to the size of displacements produced by thermal motion. Finally, we show that placing the bead in an environment with “extra” nonequilibrium fluctuations can dramatically increase power output. These experiments suggest that what was once a mere thought experiment may have practical applications.

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