Physics Colloquium

Wednesday, January 24th, 2018 at 4.00 pm
Coffee at 3.45 pm

Campus
Limpertsberg
Room BSC 2.04

Talk by Prof. John Bechhoefer
Dept. of Physics at Simon Fraser University, Canada

(Invited by Prof. Massimiliano Esposito)

The details are in the devil: Maxwell’s demon in the real world

One hundred and fifty years ago, Maxwell first posed the thought experiment that became known as “Maxwell’s demon.” Designed to understand more deeply the nature of the newly formulated second law of thermodynamics, the demon was to play a long, controversial role in the development of statistical physics. Just two months later, Maxwell’s paper “On governors” gave the first analysis of a feedback system. These two foundational works reflect the fundamental and practical aspects of control. I will present an experiment that unites the two: using feedback to create “impossible” dynamics, we make a Maxwell demon that can reach the fundamental limits to control set by thermodynamics. We test—and then extend—Rolf Landauer’s 1961 prediction that information erasure requires at least as much work as can be extracted from a system by virtue of information. These fundamental thermodynamic limits are benchmarks for evaluating the performance of practical information engines, such as those active within cells and other complex systems.

John Bechhoefer is Professor of Physics at Simon Fraser University, near Vancouver, British Columbia, in Canada. He has a background in experimental nonlinear dynamics and pattern formation, with applications to both soft matter and biophysical systems. Starting in graduate school at the University of Chicago, he has been fascinated by feedback and associated issues in control theory. This fascination led to a long tutorial presentation in Reviews of Modern Physics that is being updated and expanded to a book. His current research is at the intersection of thermodynamics, statistical physics, control theory, and information theory.

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