

## Andreas Hilfinger

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### **Exploiting stochastic fluctuations to understand cellular processes and infer biochemical kinetics**

Many biological processes in cells are complex yet sparsely characterized. Constructing physical models of such systems then often requires making many assumptions based on guesswork. Instead of ignoring or guessing unknown details in complex processes we have derived universal balance relations to rigorously characterize stochastic fluctuations in incompletely specified systems. Specifying some features of a system while leaving everything else unspecified then allows us to establish physical performance bounds for classes of intracellular processes. Additionally, we can utilize general network invariants as an experimental data analysis tool. For example, exploiting naturally occurring cell-to-cell variability allowed us to test specific hypotheses about gene expression, showing that observed fluctuations in *E. coli* contradict the majority of published models of stochastic gene expression.

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University of Cologne

Institute for Theoretical Physics

Seminar Room 0.02, Ground Floor

Hosted by

Tobias Bollenbach