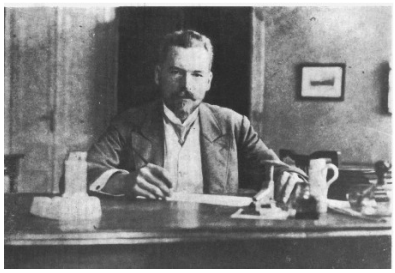

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Negative differential response in chemical reactions

Reaction currents in chemical networks can decrease when increasing their driving affinities. Such negative differential response (NDR), a hallmark of nonequilibrium physics, is found in reaction schemes of major biological relevance, namely, substrate inhibition and autocatalysis. We display it by deriving the full counting statistics of two minimal representative models by large deviation methods. We explore the consequences of NDR for biochemical networks in terms of precision-dissipation tradeoff and stability against external perturbations. Furthermore, we go beyond the realm of biochemistry and examine the relevance of NDR in artificial applications, showing how it limits the performance of dissipative self-assembly.

Summary

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