

# Fluctuations and response in sensory systems

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**T**HE statistics of fluctuations in biological sensing pathways and its relation to the response to environmental stimuli will be discussed. We shall specifically focus on bacterial chemotaxis, where detailed experiments and reliable models are available. A novel non-invasive experimental method to measure the chemotaxis response will first be presented. By using fluctuation relations, we then relate appropriate steady-state correlations to the response of the system to step and ramp stimuli of arbitrary amplitudes. That provides a systematic explanation for the observed relation between fluctuations and response and it also reconciles the out-of-equilibrium nature of the dynamics with the apparently standard form of the fluctuation-dissipation relation.