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Noise and heterogeneity in bacterial communication¹

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Many bacterial species engage in a sophisticated chemical communication behavior known as quorum sensing: Individual cells release small diffusible molecules into their environment while simultaneously detecting the local concentration of these molecules. Important collective behaviors of the bacterial population are triggered once the signal concentration accumulates to a certain level. Although quorum sensing is widespread in microbiology, the physical environment of bacteria is often very heterogeneous and diffusion may be inefficient. Meanwhile the genetic circuitry that generates and detects the chemical signal is microscopic and subject to stochasticity. This raises interesting physical questions about how much information is actually carried by these chemical signals, and what an individual cell can learn about its environment through this mechanism. I will present a general introduction to quorum sensing with emphasis on our experimental studies of the role of noise and microenvironment on this phenomenon.

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