Signaling Dynamics at the Single-Cell Level

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CELLS have a conserved repertoire of signaling pathways that function in regulation anddevelopment. Here I will discuss recent work in which we are examining the function of particular signaling pathways quantitatively in individual cells. These experiments are revealing unexpected encoding schemes, through which cells represent signals intracellularly. In many cases, these encoding schemes can enable functional behaviors that would be difficult or impossible to implement otherwise. I will focus in particular on work in the Notch-Delta pathway, where we find that same-cell (cis) interactions between the Notch receptor and its Delta ligand can generate mutually exclusive signaling states in individual cells. These states, in turn, facilitate the kinds of pattern formation processes in which Notch is used.