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*Modelling Noisy Concentration Gradients
Inside Single Cells*

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Abstract

Position determination in biological systems is often achieved through protein concentration gradients. Measuring the local concentration of such a protein with a spatially varying distribution allows the measurement of position within the system. For these systems to work effectively, position determination must be robust to noise. Here, we calculate fundamental limits to the precision of position determination by concentration gradients due to unavoidable biochemical noise perturbing the gradients. We also demonstrate the existence of an optimal length scale for the gradient for which precision is maximized, as well as analyze how precision depends on the size of the concentration-measuring apparatus. As an example of a subcellular concentration gradient, I will examine the Pom1 gradient in fission yeast. The Pom1 concentration is highest at the cell tips and reduces towards the cell centre. In this way the essential cell division protein Mid1 is precisely directed toward the cell centre.

References:

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2. N.N. Padte, S.G. Martin, M. Howard, and F. Chang, *The cell-end factor Pom1p inhibits Mid1p in specification of the cell division plane in fission yeast*, Curr. Biol. **16** (2006), 2480–2487.