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Cell Biology: Making Diffusion Your Friend

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Diffusion is the enemy of life. This is because diffusion is a ubiquitous feature of molecular motion that is constantly spreading things out, destroying molecular aggregates. However, all living organisms, whether single cell or multicellular have ways to use the reality of molecular diffusion to their advantage. That is, they expend energy to concentrate molecules and then use the fact that molecules move down their concentration gradient to do useful things.

In this talk, I will show some of the ways that cells use diffusion to their advantage, to signal, to form structures and aggregates, and to make measurements of length and size of populations. Among the examples I will describe are signaling by nerves, cell polarization, bacterial quorum sensing, length measurement of flagella and cilia, and cell size measurement. In this way, I hope to convince you that living organisms have made diffusion their friend, not their enemy.