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Magic Numbers in Protein Phase Transitions

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ABSTRACT

Biologists have recently come to appreciate that eukaryotic cells are home to a multiplicity of non-membrane bound compartments, many of which form and dissolve as needed for the cell to function. These dynamical "condensates" enable many central cellular functions – from ribosome assembly, to RNA regulation and storage, to signaling and metabolism. While it is clear that these compartments represent a type of separated phase, what controls their formation, how specific biological components are included or excluded, and how these structures influence physiological and biochemical processes remain largely mysterious. I will discuss recent experiments on phase separated condensates both in vitro and in vivo, and will present theoretical results that highlight a novel "magic number" effect relevant to the formation and control of two-component phase separated condensates.

BIO:

Ned Wingreen is the Howard A. Prior Professor of the Life Sciences at Princeton University. He is a member of the Department of Molecular Biology and of the Lewis-Sigler Institute for Integrative Genomics, where he is the associate director. He is also associated faculty in the Department of Physics. Ned received his Ph.D. in theoretical condensed matter physics from Cornell University in 1989. He did his postdoc in mesoscopic physics at MIT before moving, in 1991, to the NEC Research Institute in Princeton. At NEC, he started research in biophysics which grew into a general interest in problems at the interface of physics and biology. Ned joined Princeton University in 2004. Ned's current research includes intracellular phase separation and modeling intracellular networks in bacteria and other microorganisms, as well as studies of microbial communities. He is a fellow of the American Physical Society and the American Association for the Advancement of Science.