**Life in a Crowded Cell: How Macromolecular Crowding shapes   
Diffusion and Reactions**

Diffusion and reactions are fundamental to understanding life. While studies often focus on dilute systems, the interior of living cells presents a stark contrast: it is crowded with macromolecules that occupy 20% to 40% of the cell volume, significantly influencing virtually all intracellular processes [1]. In this talk, I will discuss the diffusion of macromolecules [2-5] and metabolites [6], highlighting key factors relevant to crowded intracellular environments, such as polydispersity of crowders [2], shapes, interactions [3], sizes [6], and flexibilities of macromolecules [4,5]. Additionally, I will examine how crowding impacts biochemical reactions, with a particular focus on enzyme-catalyzed processes [7]. Using a coarse-grained model of immunoglobulins [5], I will demonstrate how crowding conditions influence their diffusion, structural flexibility [5], and binding cooperativity [8].

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