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Contribution ID: **369** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) Diffusion in a membrane in the presence of immobile obstacles: the role of disorder

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How diffusivity (e.g., of proteins in the plane of biomembranes) is impacted by obstruction has been explored using Lattice Monte Carlo methods for random and periodic obstacle configurations. However real systems are neither periodic nor totally random. We present a study of transient and steady-state molecular diffusion in two-dimensional "Fuzzy"systems of immobile obstacles, \textit{i.e.,} systems which bridge the gap between the ideal periodic and random limits. In particular, we examine whether there are "diffusion phase transitions" , i.e., abrupt quantitative and/or qualitative changes at some critical degree of disorder. For instance, while the crossover length r^* (describing the transition from anomalous to normal diffusion) decreases when the concentration of obstacles, ϕ, increases in a periodic system, it is the opposite for random systems. Interestingly, $r^*(\phi)$ can become a very weak function of ϕ in some fuzzy systems. We investigate several ways of creating tunable disorder leading to different behaviour, and we introduce a parameter describing how the disorder in fuzzy systems impacts diffusion. Furthermore we introduce a new relation between the crossover length r^*, and the properties of the (anomalous) transient regime, including the excess diffusivity that it generates. Finally we propose new connections between the properties of the transient and steady-state regimes, most notably the possibility of estimating the steady state diffusion coefficient using early time (transient) data.

Primary authors: ILOW, Nicholas (University of Ottawa); SLATER, Gary (University of Ottawa)

Presenter: ILOW, Nicholas (University of Ottawa)

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