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Motional Coherence in Fluid Phospholipid Membranes MAIKEL RHEINSTADTER, McMaster University, JHUMA DAS, University of Missouri-Columbia, ELIJAH FLENNER, Colorado State University, BEATE BRÜNING, University of Goettingen, TILO SEYDEL, Institut Laue-Langevin, IOAN KOSZTIN, University of Missouri-Columbia — Modern experimental and computational techniques give access to collective molecular properties and raise the fundamental question of coherence in biology. While incoherent systems are systems wherein each particle is a separate, localized entity interacting with others through collisions and other energy exchanges, in a coherent regime particles lose their individual identity. Even in simple models, a biological system must be considered as an array of units interacting through coherent reactions. Coherence must therefore possibly be considered as a fundamental property of biomolecular systems. By employing high energy-resolution neutron backscattering, combined with in-situ diffraction, we have investigated slow molecular motions on nanosecond time scales in the fluid phase of phospholipid model membrane of DMPC [1]. A cooperative structural relaxation process was observed. Combined with results from a 0.1 microsecond long all atom molecular dynamics simulation, we found that correlated dynamics in lipid membranes occurs over several lipid distances, spanning a time interval from pico- to nanoseconds. [1] Rheinstadter et al., accepted for Phys. Rev. Lett., http://arXiv.org/abs/0809.3040.

Maikel Rheinstadter
McMaster University

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