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# Structure and picosecond dynamics of liposomes

Membrane formation is often listed as one of the key steps in the origins of life, since this enabled the first organisms control over the environment around their genetic material. Unilamellar liposomes are one of the simplest models available of cellular membranes, and we have used small angle neutron scattering and neutron spectroscopy to characterize their structure and dynamics [1,2].
Biomolecules exhibit dynamics over a wide range of time scales [3] and the concept of a hierarchy of motions from larger scale slower motions and faster smaller motions provides a theoretical framework [4]. Which timescales are crucial to biological function, and how motions on the different timescales correlate with each other remain open questions in membrane biophysics. Spin echo spectroscopy results on liposomes showed that above the lipid transition temperature fluctuations in the bilayer thickness could be observed on the order of 100 ns [1]. It is frequently assumed that such larger scale motions are 'lubricated' by faster motions. After characterization using small angle neutron scattering, we have studied the dynamics of liposomes on the ps timescale accessible on the PELICAN spectrometer at the Australian Centre for Neutron Scattering [2]. We observe a correlation between the bilayer fluctuations at 100 ns and the ps timescale.
Bacterial and eukaryotic cells differ in their lipid composition, notably in an increase in charged lipids for bacterial membranes. We therefore studied charged and uncharged liposomes using pure DMPC and mixtures of DMPC/DMPG. Small angle scattering shows that including charge in the membrane increases the bilayer thickness, while quasielastic neutron scattering indicates an increase in membrane mobility with increasing charge.

References
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## Topic

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