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Bicelles: disks or perforated lamellae?

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Mixtures of long-chain lipids (DMPC) and short-chain lipids (DHPC) in water form complexes with astonishing properties, which vary with temperature and with the molar ratio of the two lipids. For example, some of these objects spontaneously align in a magnetic field above the transition temperature T_m of DMPC. Various morphologies have been proposed to explain this behaviour. Using Phosphorous-31 NMR, we have been able to provide a new explanation that accounts for all observations (Triba *et al. Biophys. J.* **88**:1887–1901, 2005). We have shown that orientation depends on the formation of lipid disks, called *bicelles*, and the *increase* of their radius with temperature. We have also detected the occurrence of perforated vesicles above a second critical temperature, T_v , and the disappearance of these perforations above a third temperature T_h . The driving force for these transformations is a long known but overlooked phenomenon: the miscibility of DHPC in the DMPC bilayer. Accordingly, we have named our new model the “*mixed bicelle*” and we have determined the conditions for which it aligns efficiently in the field of an NMR magnet.