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Dynamics of inter-leaflet lipid exchange in membranes: Mechanism for stress relaxation MARK L. HENLE, L. MAHADEVAN, School of Engineering and Applied Sciences, Harvard University — Fusion and fission events in the cell membrane play a crucial role in many important biological processes, including membrane budding and vesicle recycling in the synapse. The elastic properties of the cell membrane play a crucial role in these processes. Standard elastic models assume that the exchange of lipids between membrane leaflets is negligible. While this is valid for the phospholipids in the membrane, other lipids such as cholesterol undergo rapid flip-flop between leaflets [J. A. Hamilton, *Curr. Opin. Lipidol.* **14**, 263 (2003)]. Such exchange allows a dynamic stress relaxation in the membrane via addition (removal) of lipids to expanded (compressed) regions of the leaflets. This can, for example, reduce the energetic barrier to neck formation in membrane budding, which simple elastic models have estimated to be as high as $500k_BT$. In this talk, we present a non-equilibrium model for a membrane composed of two lipids, one of which is able to flip between leaflets. For a variety of simple geometries, we find that lipid exchange can dramatically reduce the energetic barriers for bending the membrane.

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