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Measuring Lipid Membrane Viscosity Using Rotational and Translational Tracer Diffusion TRISTAN HORMEL, SARAH KURIHARA, MATTHEW REYER, RAGHUVEER PARTHASARATHY, Univ of Oregon — The two-dimensional fluidity of lipid membranes enables the motion of membrane-bound macromolecules and is therefore crucial to biological function. However, current methods of measuring membrane viscosity rely on particular membrane lipid compositions or geometries, making the comparison of different measurements difficult. We address this with a new technique for measuring lipid membrane viscosity, in which determination of both the rotational and translational diffusion coefficients of tracer particles enables quantification of viscosity as well as the effective size of the tracers. This technique is general, and can be applied to different model membrane systems to determine the effects of membrane composition and protein modulation. We present measurements of lipid membrane viscosity for two different lipids with phosphatidylcholine headgroups, finding a surprisingly wide distribution of effective tracer sizes, due presumably to a large variety of couplings to the membrane. We also compare the effective viscosity of two different structures – black lipid membranes and membrane multilayers – as well as changes in viscosity induced by peripheral protein binding.

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