Membranes deform as a natural part of many biological processes and the deformation of membranes is hindered by the internal viscosity of the membrane and the aqueous viscosity of the ambient medium. As a practical matter, one would like to know in what regimes aqueous or membrane viscosity dominate time courses of membrane deformations predicted by theory. For example, a standard theory used to predict pore dynamics in liposomes assumes that dissipation is dominated by the viscosity of the bilayer when in fact pore growth and shrinkage is slowed as aqueous viscosity is experimentally increased.

Recently, we developed a theory that predicts for giant liposomes, tens of microns in radius, aqueous viscosity dominates over the effects of membrane viscosity. In this theory, the aqueous friction coefficient of the pore was obtained by empirically fitting to experimental data. We have now determined the precise mathematical value of the friction coefficient by giving a self contained derivation of the flow field induced by the contraction of a pore in a spherically shaped membrane. The agreement between the empirical and theoretical value of the friction coefficient is excellent.

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For further information see http://www.esam.northwestern.edu

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