
The authors wish to note the following: “We have determined that the conclusions stated in our paper are an artifact of errors of analysis. Our methods involved determining the rheological properties of lipid bilayers from analysis of the trajectories of lipid-anchored particles. Errors related to the particle-tracking methods we used generated an artifactual elastic-like signature.

The imprecision in tracking resulted from determining the position of each particle by fitting the logarithm of the particle’s intensity profile to a quadratic function. Directly fitting the intensity to a Gaussian form is considerably less sensitive to noise and signal intensity. This improved fitting reduces positional uncertainty in test images from around 30 nm to a few nm and, applied to our membrane data, completely eliminates the “elastic” response (Figure 1). Moreover, adding 30 nm of random error to precisely tracked images reproduces the reported elastic signature. Therefore, our data indicate that lipid membranes show a purely viscous character over the entire frequency range examined. Our initial assessments of particle tracking algorithms were not sufficiently stringent, leading to an overestimate of our tracking precision and the use of inadequate fitting methods.

Figure 1: (Left) Shear moduli (\(G'\) = elastic modulus, \(G''\) = viscous modulus) for a set of membrane-anchored tracer particles, tracked using a linearized Gaussian fit (i.e. fitting a 2-dimensional quadratic function to the logarithm of the particles’ intensity distributions).
The artifactual elastic response we reported showed a feature at the chain ordering transition temperature of the lipid membranes examined. We are not certain what aspect of the images, when imprecisely tracked, led to this feature. We suspect that motions of the particles perpendicular to the membrane plane may be responsible.

The conclusions of the paper are wrong and regrettably we must retract the work. We sincerely apologize for any confusion that our report may have caused.”

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