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Probing Brownian Motion of an Ellipsoid with an External Force

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— Brownian motion has translational and rotational degrees of freedom. Anisotropy in the shape of a Brownian particle leads to dissipative coupling between translational and rotational motion. However, the coupling effects, which depend on the initial orientation of an ellipsoid, cannot be detected by most typical experimental techniques. To surmount the hurdle between theoretical predictions and experimental measurements, we present a theoretical scheme for uncovering the translation-rotation coupling by applying a constant external force to an ellipsoid in a two-dimensional suspension. The geometry of the ellipsoid can be determined using the first two cumulants. An anisotropy-isotropy alternation is found in the cumulant series. We also discuss the probability distribution function (PDF) of lab-frame displacements to gain insight into the significance of anisotropy of a Brownian particle in diverse environments.

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