

Abstract Submitted
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Chromosomal Loci Move Subdiffusively through a Viscoelastic Cytoplasm ANDREW SPAKOWITZ, STEPHANIE WEBER, JULIE THERIOT, Stanford University — Tracking of fluorescently labeled chromosomal loci in live bacterial cells reveals a robust scaling of the mean square displacement (MSD) as $\tau^{0.39}$. Brownian dynamics simulations show that this anomalous behavior cannot be fully accounted for by the classic Rouse or reptation models for polymer dynamics. Instead, the observed motion arises from the characteristic relaxation of the Rouse modes of the DNA polymer within the viscoelastic environment of the cytoplasm. To demonstrate these physical effects, we exploit our general analytical solution of the subdiffusive scaling for a monomer in a polymer embedded in a viscoelastic medium. The time-averaged and ensemble-averaged MSD of chromosomal loci exhibit ergodicity, and the velocity autocorrelation function is negative at short time lags. These observations are most consistent with fractional Brownian motion and rule out a continuous time random walk model.

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