

Abstract Submitted
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A “diffusing diffusivity” model of “anomalous yet Brownian” diffusion of colloidal particles MYKYTA V. CHUBYNSKY, GARY W. SLATER, Department of Physics, University of Ottawa, Canada — “Anomalous yet Brownian” diffusion of colloidal beads, with a mean-square displacement (MSD) exactly linear in time (as in simple Fickian diffusion) but an exponential (rather than Gaussian) displacement distribution (DD) at short times for large displacements, has been reported recently by Granick’s group [1] in several systems. We argue that a strictly linear MSD with a non-Gaussian DD is a universal feature of systems with “diffusivity memory” (a particle diffusing faster is likely to keep diffusing faster for some time), but without “direction memory” (a jump in a particular direction does not change the probability of subsequent jumps in that direction). We consider a series of toy models reproducing this behavior in which a particle undergoes regular diffusion, but its diffusivity itself performs a (perhaps biased) random walk. The DD is strictly exponential at short times when the diffusivity distribution itself is exponential, but an exponential remains a good fit for a variety of diffusivity distributions.

[1] Wang et al., PNAS 106 (2009) 15160.

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