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Microscopic statistical dynamical theory of correlated motion in glassy fluids and suspensions DANIEL SUSSMAN, KEN SCHWEIZER, University of Illinois at Urbana-Champaign — The naive mode coupling theory and the stochastic nonlinear Langevin equation theory of single particle activated glassy dynamics has been extended to treat the correlated motion of two tagged particles in a dense fluid. Starting with a generalized Langevin equation deduced using projection and mode coupling approximations, we derive an effective nonequilibrium free energy surface for the stochastic motion of the tagged degrees of freedom. The dynamical free energy surface involves contributions from an ideal entropic term, the potential of mean force, and a many particle 'caging' term that is explicitly dependent on the relative separation between the particles. The theory allows the study of space-time dynamic heterogeneity effects, including the length scale beyond which single particle motion of two tagged particles becomes independent and how the emergence of irreversible rearrangements affects the equilibrium pair structure relaxation. Numerical results for hard sphere fluids and colloidal suspensions will be presented.

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