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SUSPENSION FLOWS AND STOCHASTIC MODELS: WAYS TO CAPTURE THE CONTINUING NATURE AND INTERNAL ORGANIZATION

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We continue to seek a means to describe experimental results from studies of flowing blood-like suspensions in accepted mathematical forms. When two signs are changed in the expression for the expectation of the square of position increments for an Ornstein-Uhlenbeck (OU) process, the data obtained from experiments of several distinctive types fit very well. Our suspension flows are all induced by a syringe pump and so differ strongly from the equilibrium situation assumed by Einstein when he derived the Brownian motion of a free particle. Recent, more direct plotting of data demonstrated a cumulative probability curve for sorted amplitudes of forward and backward velocities estimated as a tangent bundle using nested ending criteria. (For definitions of forward and backward velocities, see E. Nelson, Phys.Rev. 150, 1079, 1966. Nested ending criteria occur when serial first passage measurements are made for an ensemble sharing the same initial conditions; the article by Kac in Wax, Noise and Stochastic Processes, Dover, 1954, includes this idea.) Nelson showed, but did not exploit, a fluid model in his article. He began with the OU process and added an acceleration term originating in an external field. The form used by Nelson and a similar term that is a part of a triplet of stochastic differential equations developed by Ebeling and Schweitzer for active Brownian motion are interesting as possible ways towards an understanding of the switched signs. As well, Van den Broecks stochastic model of Aris-Taylor dispersion (which is usually treated by convective diffusion) includes the useful concept of tracks of velocity, which fits well with enlarged considerations of the model. Our talk will report on our examinations of and reasons to favor these mathematical forms.

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