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Strong-coupling dynamics of chemotaxis RAMON GRIMA, Department of Physics and Astronomy, Arizona State University, TIMOTHY NEWMAN, Department of Physics and Astronomy, Arizona State University — In this talk we present a stochastic model of cell-cell interactions. This model has recently been introduced to study the role of fluctuations in chemotaxis and related cell movement phenomena. The strong-coupling behavior of the model is studied by means of an asymptotic analysis. For the case of the cell diffusion coefficient less than the chemical diffusion coefficient, it is possible to show that for positive chemotaxis we obtain renormalization of the cell diffusion coefficient for all coupling strengths, ruling out self- localization of a single cell due to auto-chemotaxis. For negative chemotaxis, the model predicts renormalized diffusive behavior for weak coupling and ballistic behavior at larger coupling strengths in one and two dimensions. In three dimensions this transition is only manifest subject to a constraint. The case of auto-chemotaxis is also studied via a cellular automaton model. We show that the temporal dynamics are very sensitive to microscopic details, in particular as to whether the chemical field is modeled through individual random walkers moving on an underlying spatial grid or through a deterministic diffusion equation.

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