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Connecting single cell to collective cell behavior in a unified theoretical framework MISHEL GEORGE, FRANCESCO BULLO, OTGER CAMPÀS, University of California - Santa Barbara — Collective cell behavior is an essential part of tissue and organ morphogenesis during embryonic development, as well as of various disease processes, such as cancer. In contrast to many *in vitro* studies of collective cell migration, most cases of *in vivo* collective cell migration involve rather small groups of cells, with large sheets of migrating cells being less common. The vast majority of theoretical descriptions of collective cell behavior focus on large numbers of cells, but fail to accurately capture the dynamics of small groups of cells. Here we introduce a low-dimensional theoretical description that successfully captures single cell migration, cell collisions, collective dynamics in small groups of cells, and force propagation during sheet expansion, all within a common theoretical framework. Our description is derived from first principles and also includes key phenomenological aspects of cell migration that control the dynamics of traction forces. Among other results, we explain the counter-intuitive observations that pairs of cells repel each other upon collision while they behave in a coordinated manner within larger clusters.

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