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Self-Polarization of Cells in Elastic Gels ASSAF ZEMEL, SAMUEL SAFRAN, Department of Materials and Interfaces, The Weizmann Institute of Science, Rehovot, 76100, Israel — The shape of a cell as well as the rigidity and geometry of its surroundings play an important role in vital cellular processes. The contractile activity of cells provides a generic means by which cells may sense and respond to mechanical features. The matrix stresses, that depend on the elasticity and geometry of cells, feedback on the cells and influence their activity. This suggests a mechanical mechanism by which cells control their shape and forces. We present a quantitative, mechanical model that predicts that cells in an elastic medium can self-polarize to form well ordered stress fibers. We focus on both single cells in a gel, as well as on an ensemble of cells that is confined to some region within the gel. While the *magnitude* of the cellular forces is found to increase monotonically with the matrix rigidity the *anisotropy* of the forces, and thus the ability of the cells to polarize, is predicted to depend non-monotonically on the medium's rigidity. We discuss these results with experimental findings and with the observation of an optimal medium elasticity for cell function and differentiation.

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