Abstract Submitted
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Modeling traction forces in collective cell migration JULIANE ZIMMERMANN, Center for Theoretical Biological Physics, Rice University, MARKUS BASAN, Department of Physics, University of California at San Diego, RYAN L. HAYES, Center for Theoretical Biological Physics, Rice University, WOUTER-JAN RAPPEL, Department of Physics, University of California at San Diego, HERBERT LEVINE, Center for Theoretical Biological Physics, Rice University — Collective cell migration is an important process in embryonic development, wound healing, and cancer metastasis. We have developed a particle-based simulation for collective cell migration that describes flow patterns and finger formation at the tissue edge observed in wound healing experiments [1]. We can apply methods for calculating intercellular stress to our simulation model, and have thereby provided evidence for the validity of a stress reconstitution method from traction forces used in experiments [2]. To accurately capture experimentally measured traction forces and stresses in the tissue, which are mostly tensile, we have to include intracellular actomyosin contraction into our simulation. We can then reproduce the experimentally observed behavior of cells moving around a circular obstacle [3], and suggest underlying mechanisms for cell-cell alignment and generation of traction force patterns. [1] Basan, M., J. Elgeti, E. Hannezo, W.-J. Rappel, H. Levine. Proc. Natl. Acad. Sci. USA. 2013. [2] Zimmermann, J., R. L. Hayes, M. Basan, J. N. Onuchic, W.-J. Rappel, H. Levine. Biophys. J. 2014. [3] Kim, J. H., X. Serra-Picamal, D. T. Tambe, ..., J. J. Fredberg. Nature Mater. 2013.

Juliane Zimmermann
Center for Theoretical Biological Physics, Rice University

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