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Interface mechanics determining biological cell shapes SASCHA HILGENFELDT, ESAM and Mechanical Engineering, Northwestern University, RICHARD CARTHEW, Department of Biochemistry, Molecular Biology, and Cell Biology, Northwestern University — To form a functional tissue, biological cells often adhere to each other establishing connections between membranes by means of cadherin molecules. The cells achieve a well-defined relative orientation as well as a faithfully prescribed shape. An excellent example is the cell cluster making up each ommatidium element in the drosophila eye. The similarity of the shape of these cells to connected soap bubbles has been remarked upon [1]. We show that, in order to explain the observed shapes of wild-type and mutant ommatidia, the soap film model has to be expanded into a realistic description of biological membranes and their mechanical properties including changes in interfacial tension due to the presence of cadherins. Surface Evolver simulations demonstrate that realistic modeling of the shape of cell clusters can be obtained using surface energy terms only, emphasizing the importance of interfacial phenomena in cell mechanics and cell morphology.
[1] T. Hayashi & R. W. Carthew, Nature **431**, 647 (2004)

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