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Polymer Microlenses for Quantifying Cell Sheet Mechanics GUILLAUME MIQUELARD-GARNIER, University of Massachusetts Amherst, JESSICA ZIMBERLIN, PATRICIA WADSWORTH, ALFRED CROSBY — Mechanical interactions between individual cells and their substrate have been studied extensively over the past decade; however, our understanding of how these interactions change as cells interact with neighboring cells in the development of a cell sheet, or early stage tissue, is less developed. We present a recently developed experimental technique for quantifying the mechanics of confluent cell sheets (Zimberlin J.A., et al., Cell Motility and the Cytoskeleton, 65, 9, 762). Living cells are cultured on a thin film of polystyrene [PS], which is attached to a patterned substrate of crosslinked poly(dimethyl siloxane) microwells. As the cell sheet grows, cells apply sufficient force to buckle the PS film over individual microwells to form a microlens array. The curvature for each microlens is measured by confocal microscopy and can be related to the strain and stress applied by the cell sheet. We demonstrate that this technique can be used to decouple mechanical contributions of intercellular junctions and focal adhesions while also providing insight into the important materials properties and length scales that govern cell sheet responses.

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