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Fluid flow in monolayers: Cells under pressure KYLE SCHULZE, STEVEN ZEHNDER, GREG SAWYER, THOMAS ANGELINI, University of Florida — Number density fluctuations are intimately tied to collective behavior in particulate soft matter and active matter systems, including tissue cell monolayers. In cell monolayers, there is no free space between cells, so density fluctuations must involve either out of plane motion, or cell volume fluctuations. Recent work has shown that cells fluctuate in volume to accommodate collective density fluctuations, and that fluid moves between cells in this process. However, measurements of the resistance to this flow with controlled applied pressures have never been performed. Here we apply pressure to local regions in cell monolayers with an indentation instrument mounted on an inverted microscope. While simultaneously measuring contact area, indentation depth, and applied force as a function of time we determine a compression modulus and a permeability of cells. We find that cells are highly permeable, and that cytoskeleton-generated stresses are large enough to drive fluid from cell to cell as they spontaneously fluctuate in volume.

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