

Micropipette Aspiration interpretation

Results saved under:

{MainPath}/ExampleSimulations/Pipette/

The script to visualize the saved data:

{MainPath}/ExampleSimulations/displaySave.sh — please modify executable path and select the pipette option.

The video of simulation can be found under:

{MainPath}/ExampleSimulations/Pipette/

A non-intrusive method to measure the local stiffness of a material sample is using suction. A pipette is attached to the material and a known pressure is applied, then the height of the material sucked in depends on the Young's modulus. For simple cases, where the material is uniform and significantly larger than the measurement pipette, especially in its thickness, there are analytical interpretations. The biological samples are made up of complex heterogeneous layers, and their size is mostly comparable to the pipette size, therefore analytical formula cannot be used for stiffness interpretation. Here, I repeat such an experiment to fit the Young's modulus of the measured biological sample.

Tissue physical state:

The top surface has high stiffness due to dense polymer mesh on top: **actin rich layer** (actin is a cytoskeleton protein, forming this dense mesh at tissue surface).

The rest of the **cellular layer** is softer than the top surface. Both layers have a Poisson's ratio of 0.45.

The material physical properties are heterogeneous.

The tissue is stuck to a surface at the bottom.

The pressure and size of the pipette are taken from experiments.

