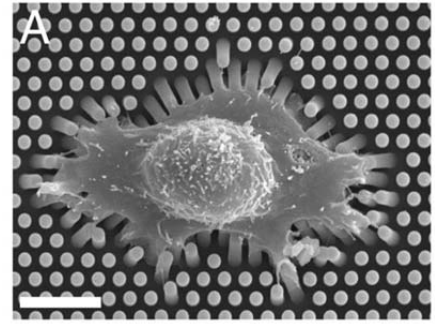


## Cellular Bioengineering Project 2 – Experimental Measurement Techniques

### FINAL PAPER DUE in Class March 6th, 2014\*

*Draft due by February 27th, 2014*

A big focus of this class is to discuss measurement techniques that researchers use to study cells. This project gives you the opportunity to pick one of the techniques we have talked about (or will talk about) and to explore it in detail in the form of a mini-review.

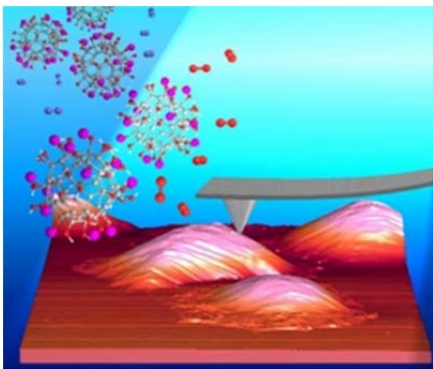


<http://www.pnas.org/content/109/18/6933/F1.large>.

Your assignment is to choose a quantitative measurement technique that is applied to cells to write about. Your paper must include both the theory behind the technique (mathematical or device design) and what the technique is used for in bio(engineering).

- Pick a specific technique to investigate and also a small, but reasonable number of papers that use this technique in a specific way. Try to narrow your focus quickly.
- This is a technical assignment and, thus, you will need to engage in qualitative and/or quantitative analysis of the technique. To do this, you will need to answer these (or related) questions:
  - o What is actually measured? And what is inferred from that?
  - o Very important – What assumptions go into those conclusions?
  - o What is the measurement range (pN to nN, single cells vs. whole culture, etc)?
  - o What are the limitations/advantages of the technique?
  - o What are other similar/alternate techniques?
- Your write-up will be no more than 4 pages in IEEE format (choose your own sections).
- You will be evaluated on your clear communication of the material, your technical understanding of the technique, and a thorough analysis of its assumptions and limitations.

As always, I'm available for discussion of choosing a topic, any other aspect of this project and its material. I particularly encourage you to speak to me if you are interested in one of the topics we have not yet covered. Choose your topics by February 20<sup>th</sup>. Some potential topics are:



<http://ipmc.epfl.ch/page-21503-en.html>

- Laser tweezers (optical traps) or magnetic tweezers
- Magnetic twisting cytometry
- Atomic force microscopy (see figure at left)
- Traction force microscopy
- Surface patterning to control cell adhesion
- Microfabrication of devices to measure cell forces
- Rheology of cytoskeletal or extracellular matrix gels (models or experiment)
- Other (another technique is ok, but you must get my approval to make sure it fits within the course.)

\*A 20%/day grade decrease will be applied late papers. Requests for extensions will be generously considered if they are made in a timely manner.