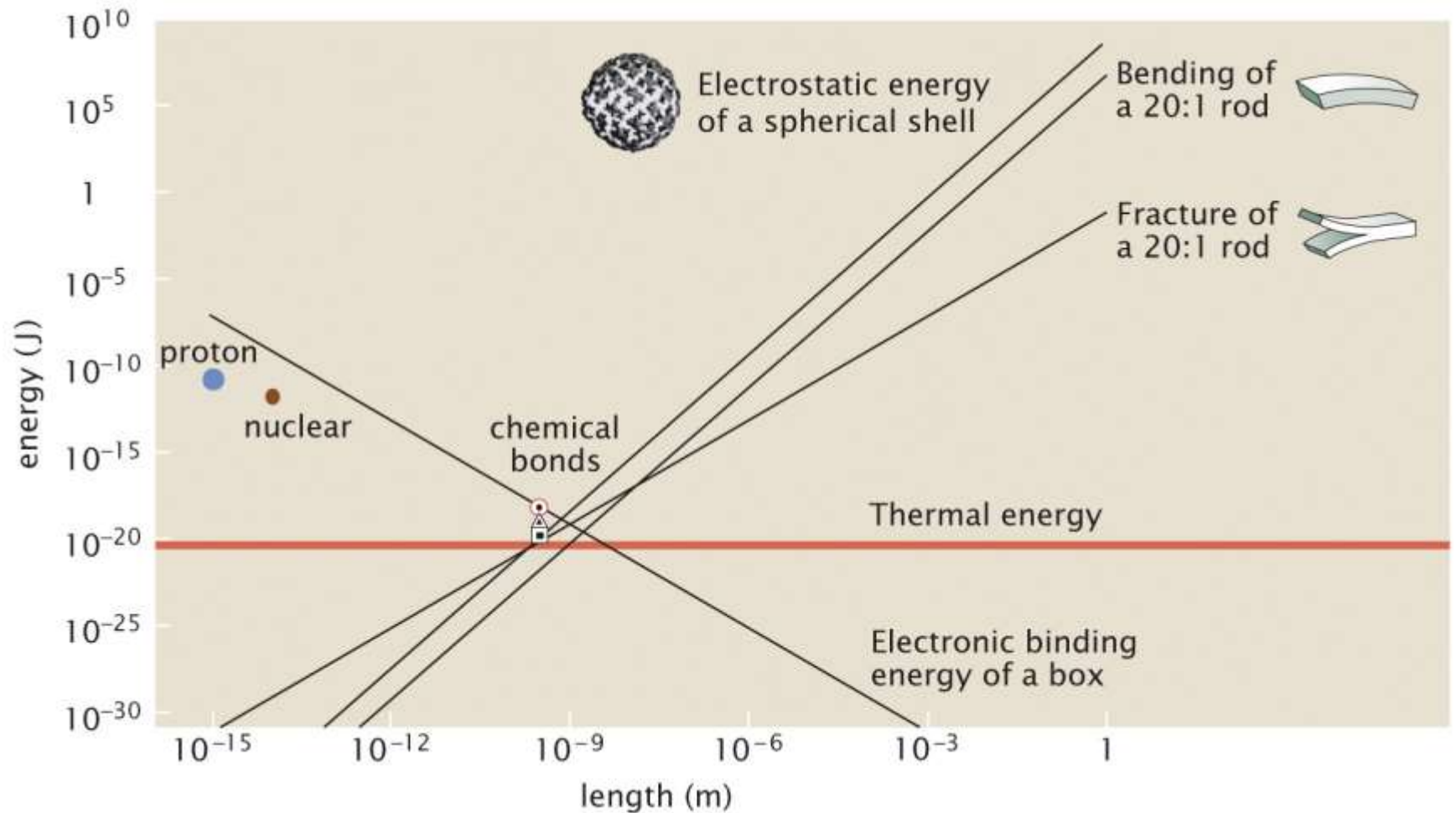


Energy as Function of Length Scale



Brownian Motion in Gravity Field

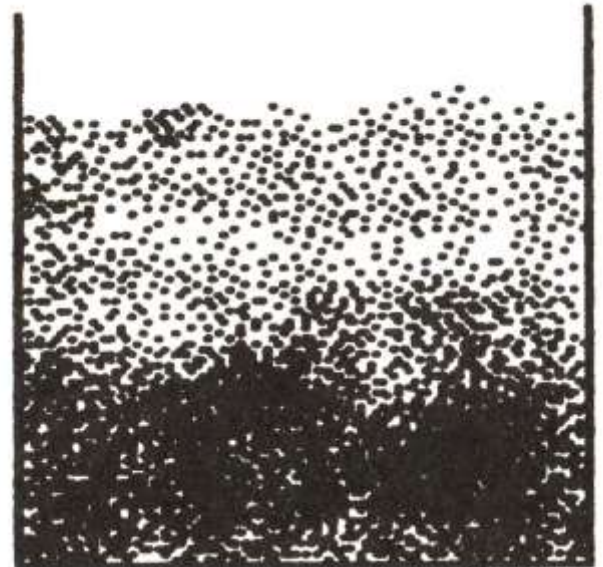


Brownian motion of red lead particles in acetone

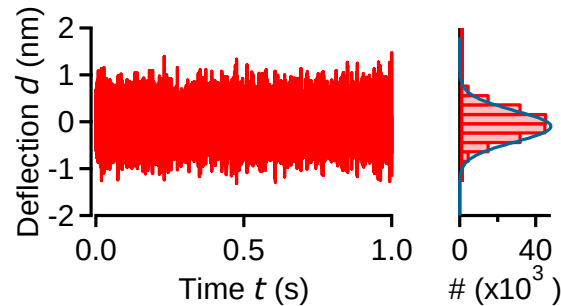
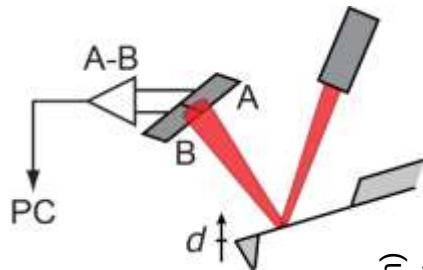
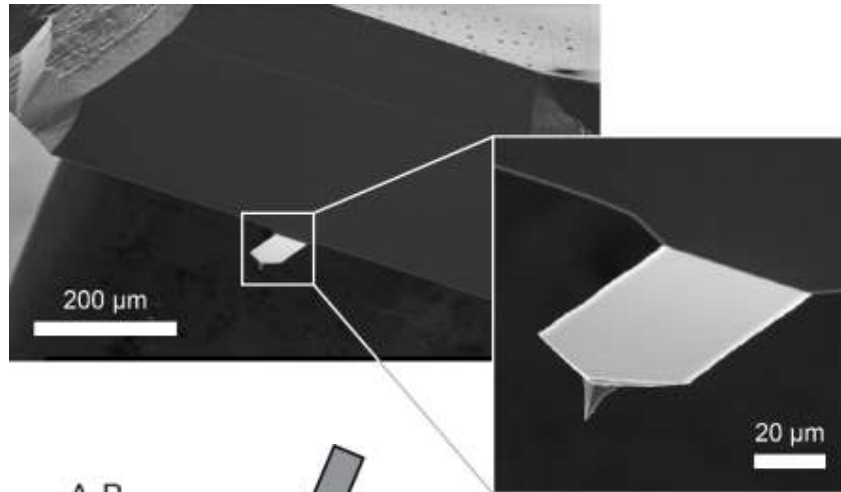
real time, magnification 800 x

trick: density 8.3 vs. 7.8 g/cm³, tilted slide

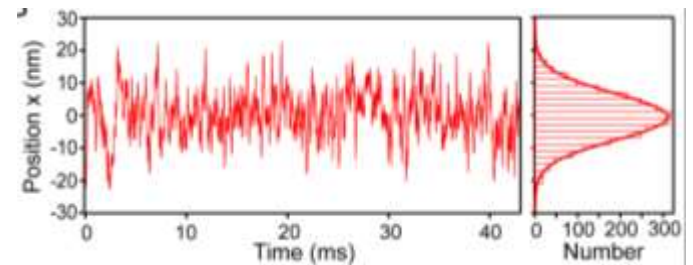
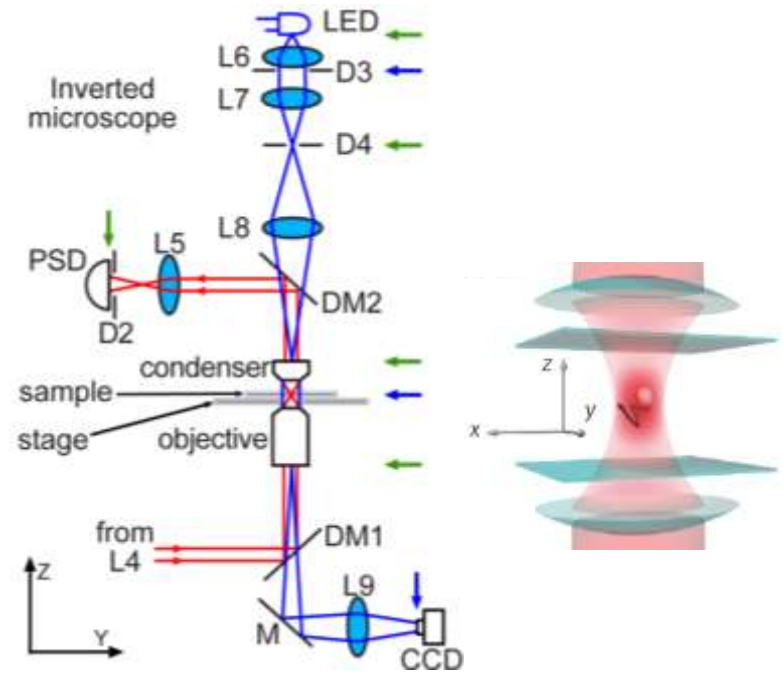
https://www.youtube.com/watch?v=J-YftHUva_o



Thermal Noise in AFM and Optical Trap



→ Thermal noise ca. 0.3 nm



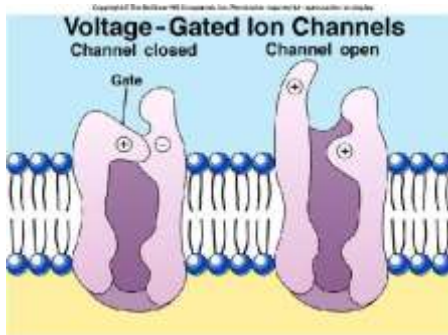
Huang *et al.* Nature Physics **7** (2011)

DOI: 10.1038/nphys1953

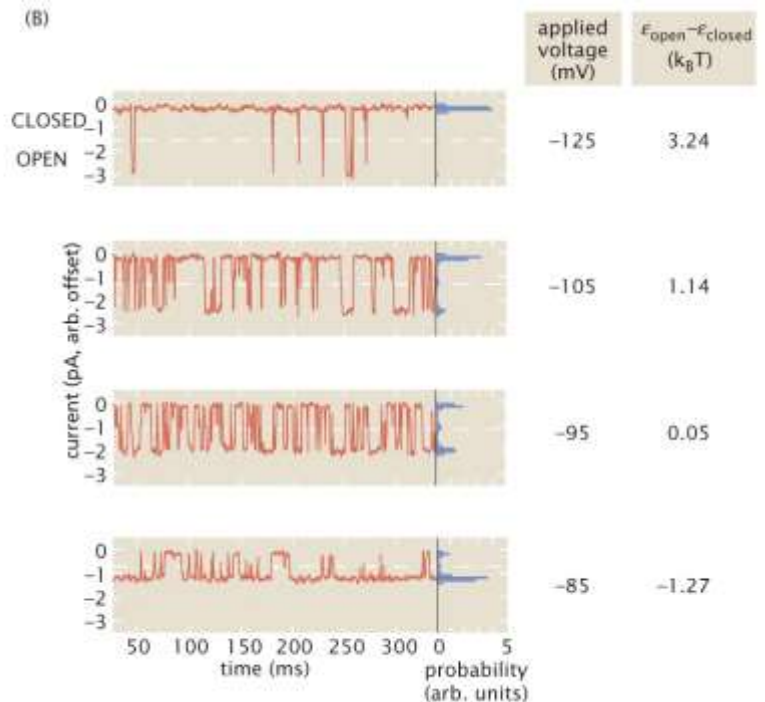
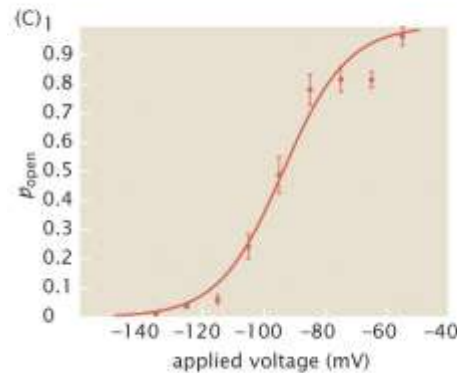
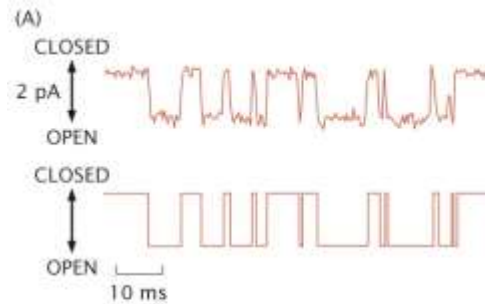
Hernández Candia *et al.* PLoS ONE **8** (2013)

DOI: 10.1371/journal.pone.0057383

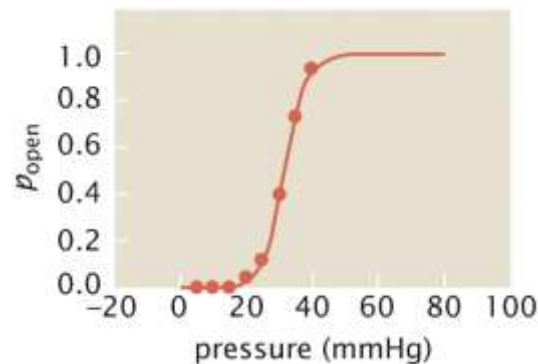
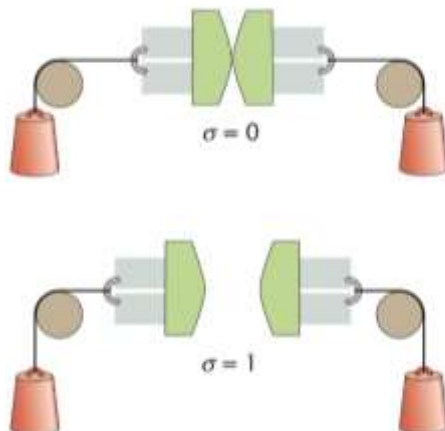
Voltage-Gated and Mechanosensitive Ion Channels



<http://faculty.southwest.tn.edu/rburkett>



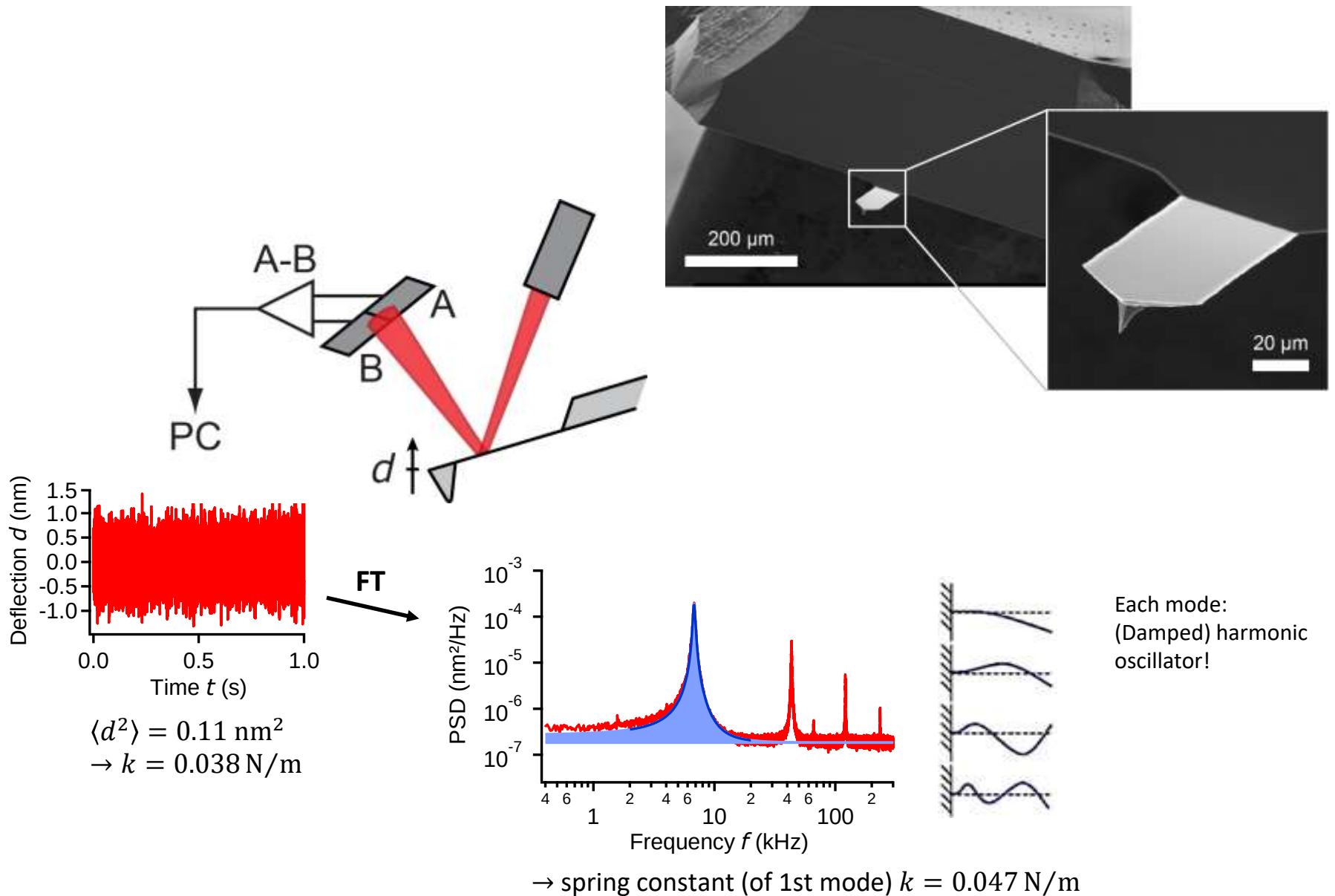
Keller *et al.* J. Gen. Physiol. **88** (1986)



Perozo *et al.* Nat. Struct. Biol. **9** (2002)

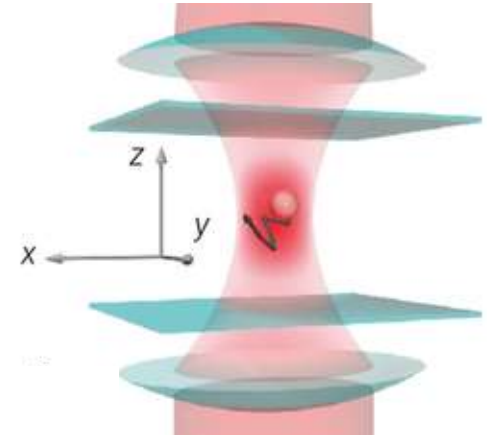
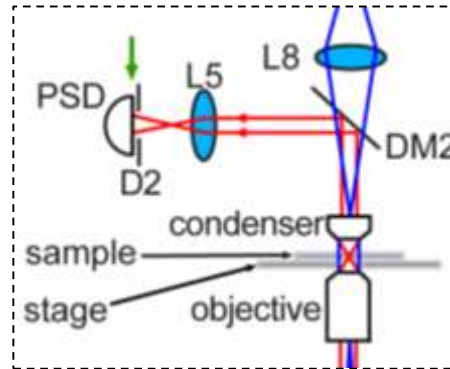
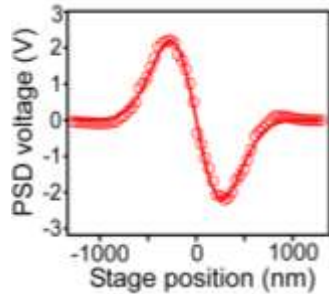
<http://microsite.garlandscience.com>

Calibration of AFM Cantilever

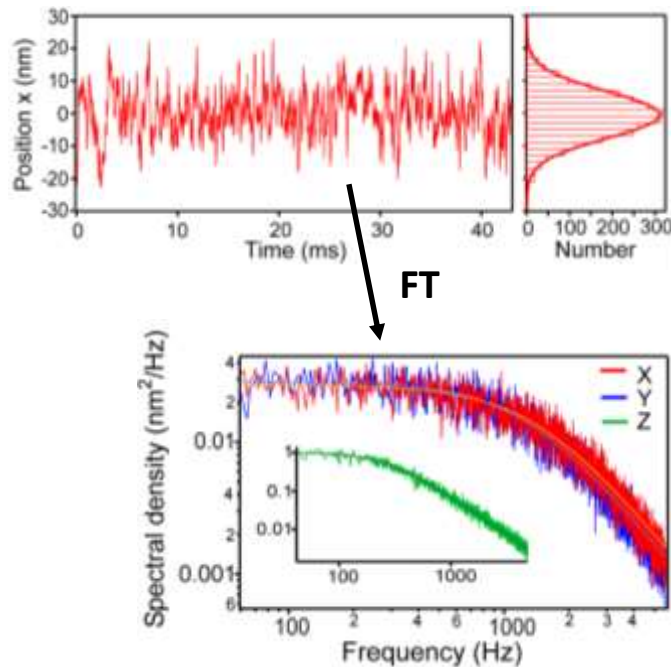


Calibration of Optical Trap

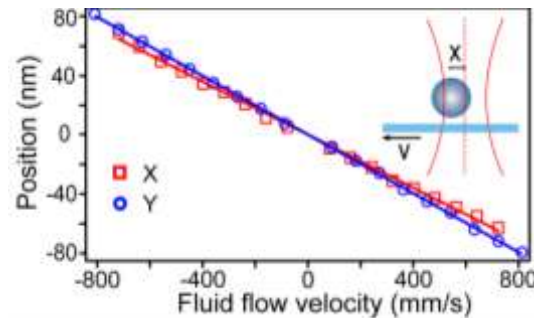
Detector Sensitivity:



Trap Spring Constant:



Particle Size:

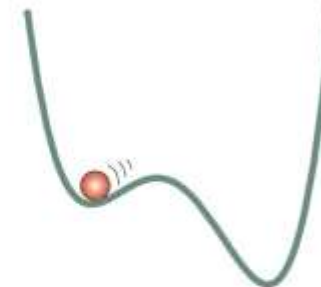
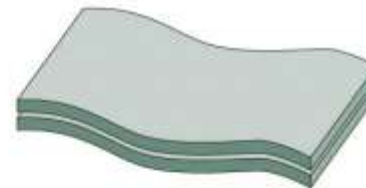
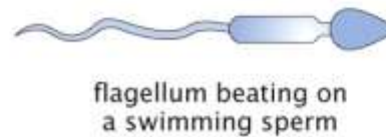
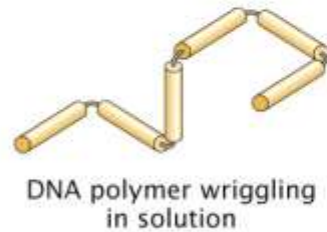
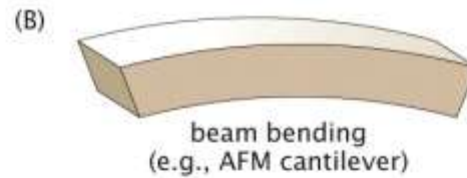
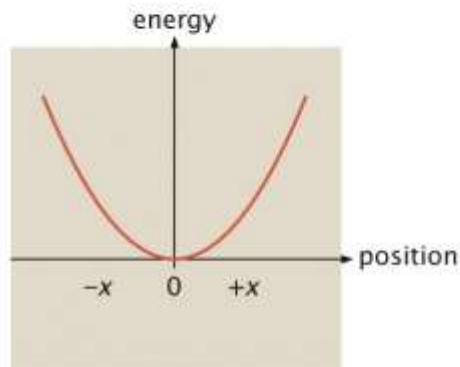
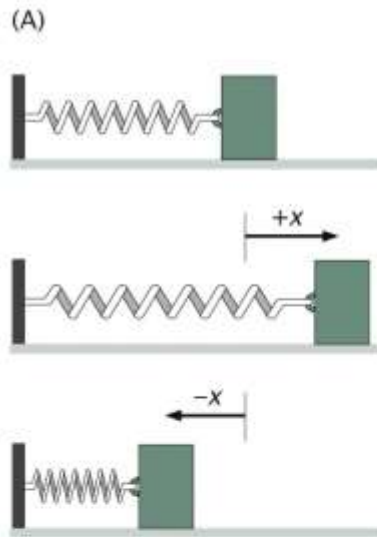


Stokes Law!

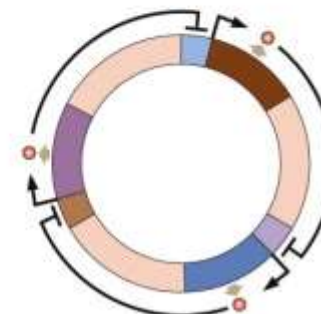
Overdamped
harmonic oscillator

Huang *et al.* Nature Physics **7** (2011)
DOI: 10.1038/nphys1953
Hernández Candia *et al.* PLoS ONE **8** (2013)
DOI: 10.1371/journal.pone.0057383

The „Springiness“ of Systems



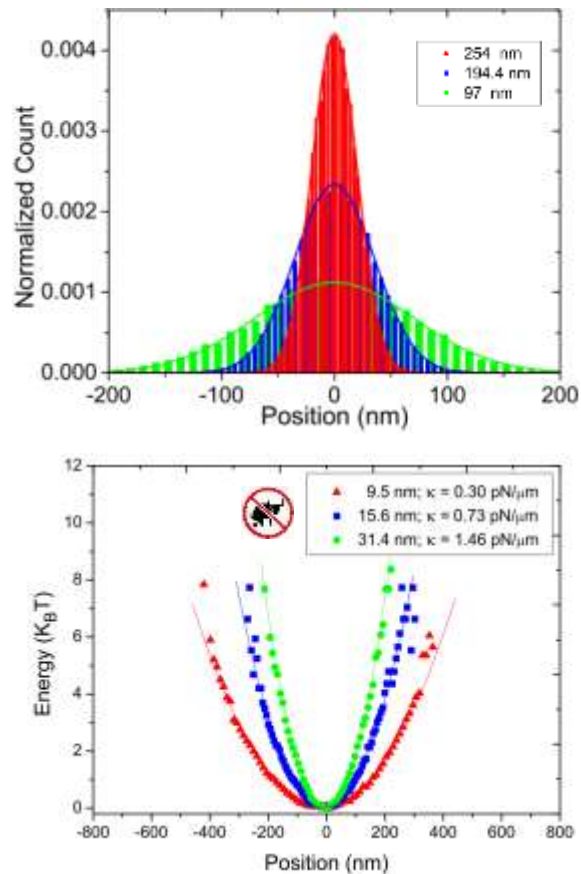
molecules in an energy landscape



genetic network changing expression levels over time

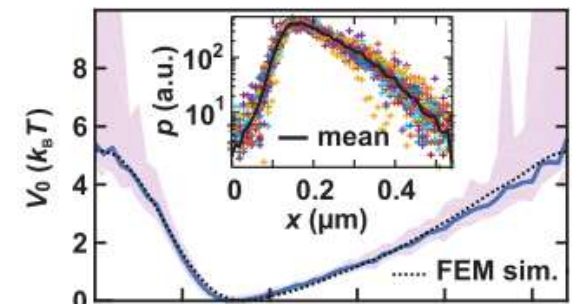
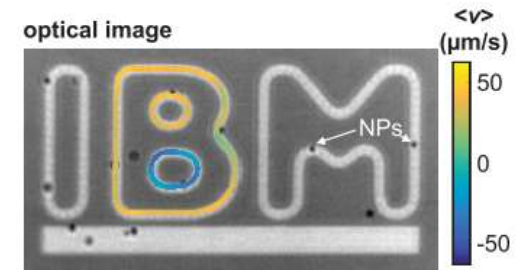
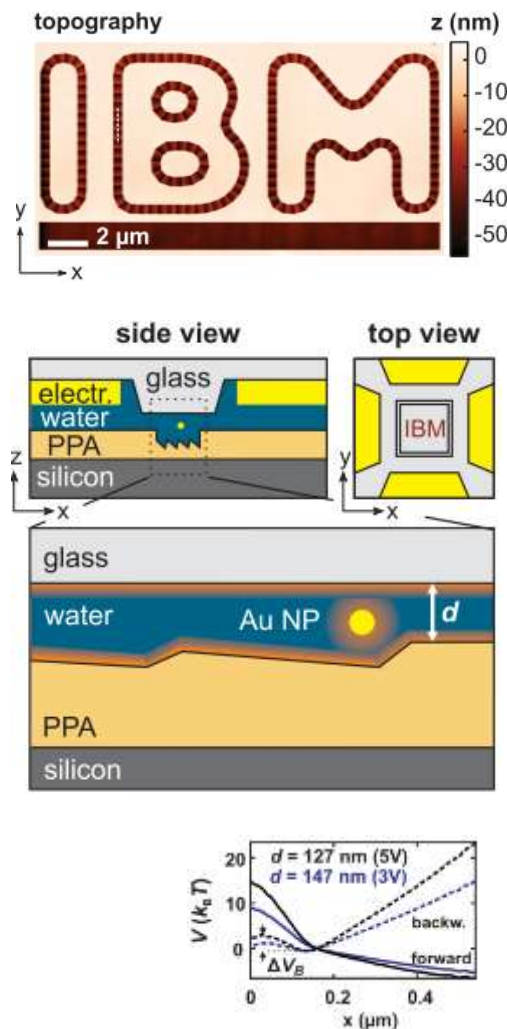
Energy Landscape from Thermal Energy

Optical Trap



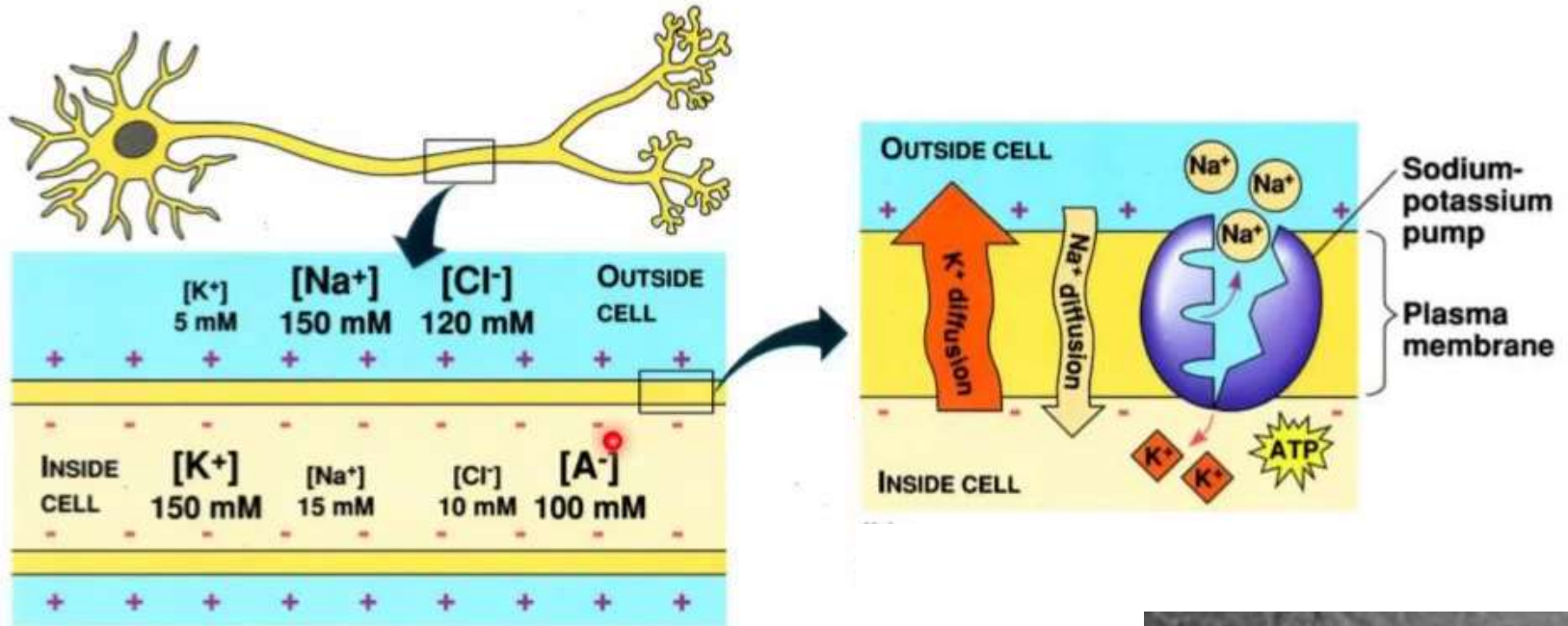
Hajizadeh *et al.* Optics Express **18** (2010)
DOI: 10.1364/OE.18.000551

Brownian motors

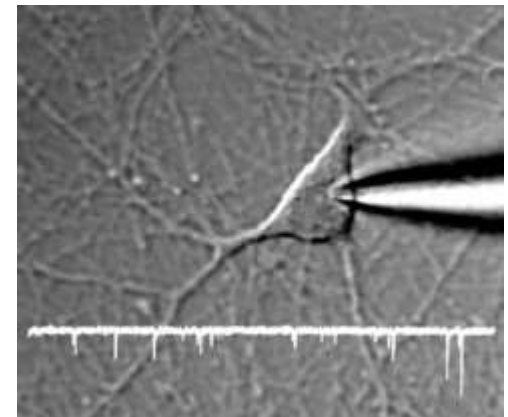


Skaug *et al.* Science **359** (2018)
DOI: 10.1126/science.aal3271

Membrane Potential

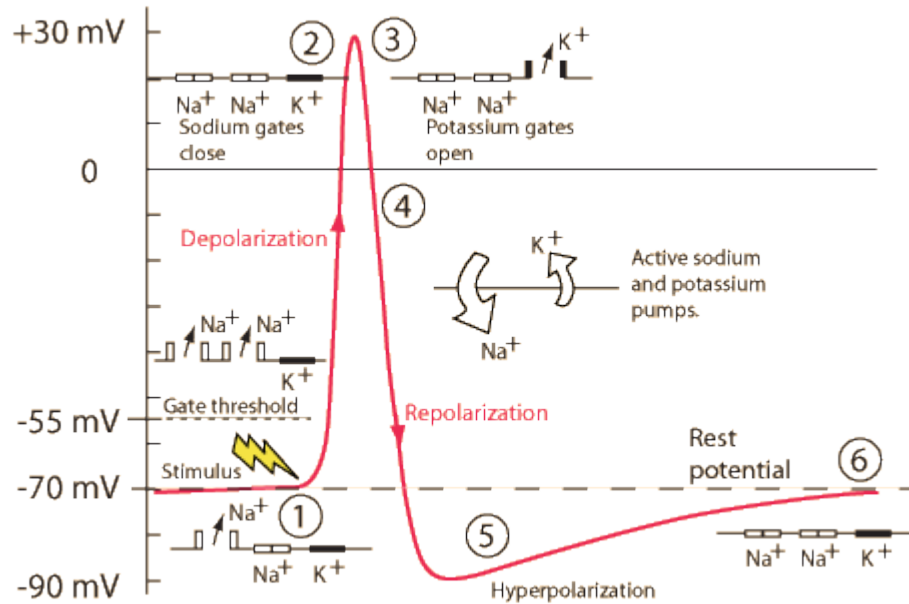


<https://www.youtube.com/watch?v=JApn3gRr8Q8>

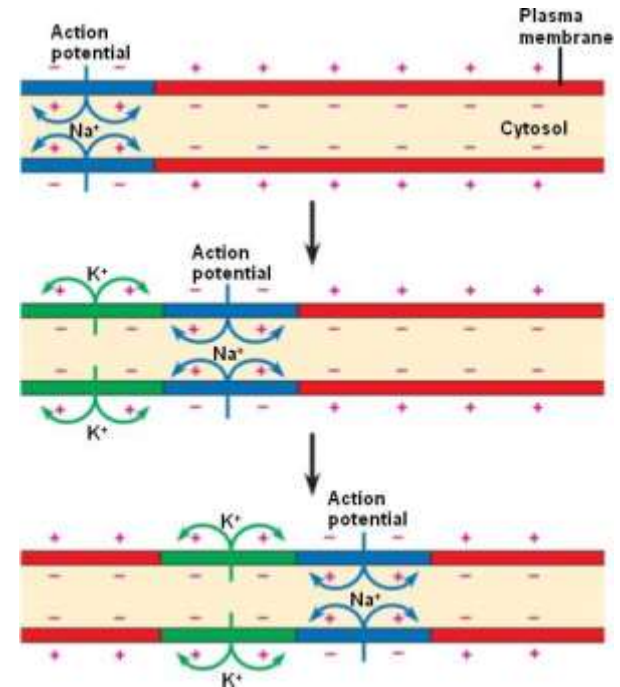


<http://cbn.charite.de>

Action Potential

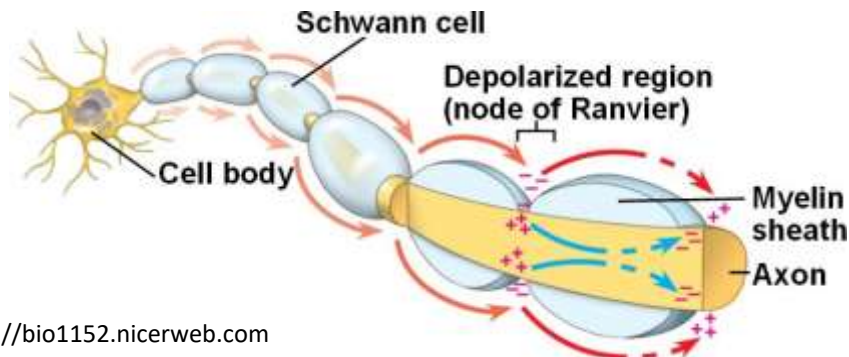


<http://hyperphysics.phy-astr.gsu.edu>



<http://hmphysiology.blogspot.de>

Saltatory Conduction



<http://bio1152.nicerweb.com>