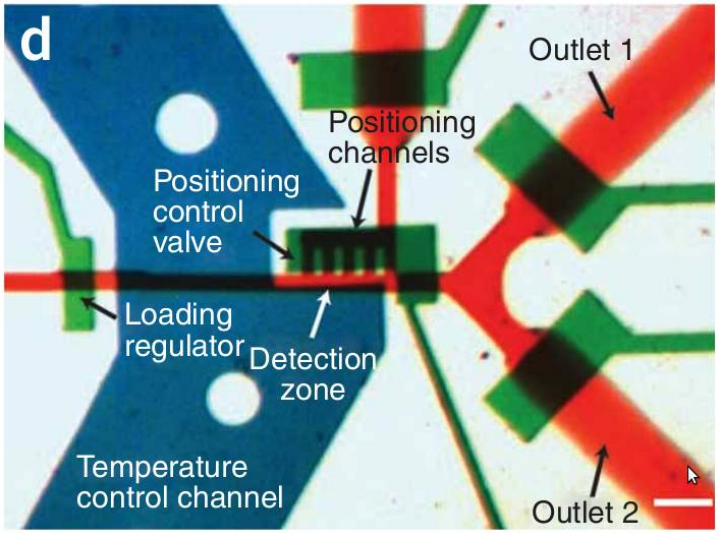
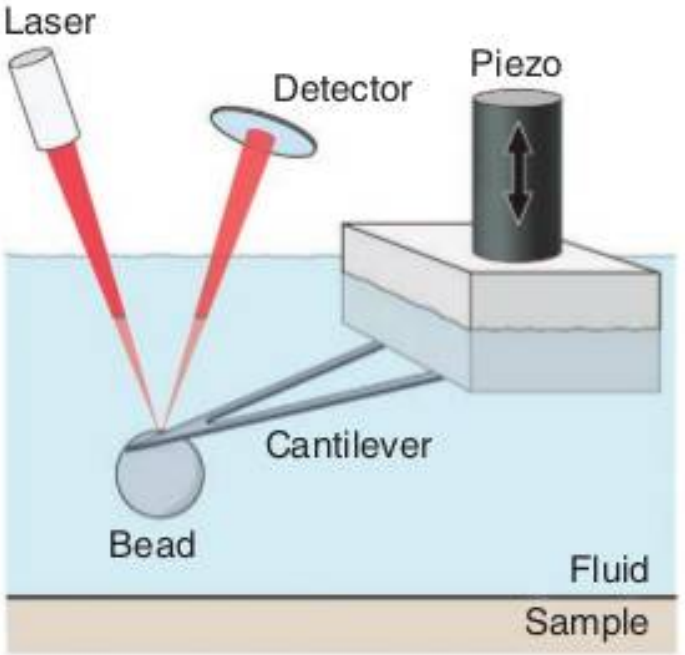




Worm Club Journal Club

Joey Doll

August 1, 2011

Automated on-chip rapid microscopy, phenotyping and sorting of *C. elegans*

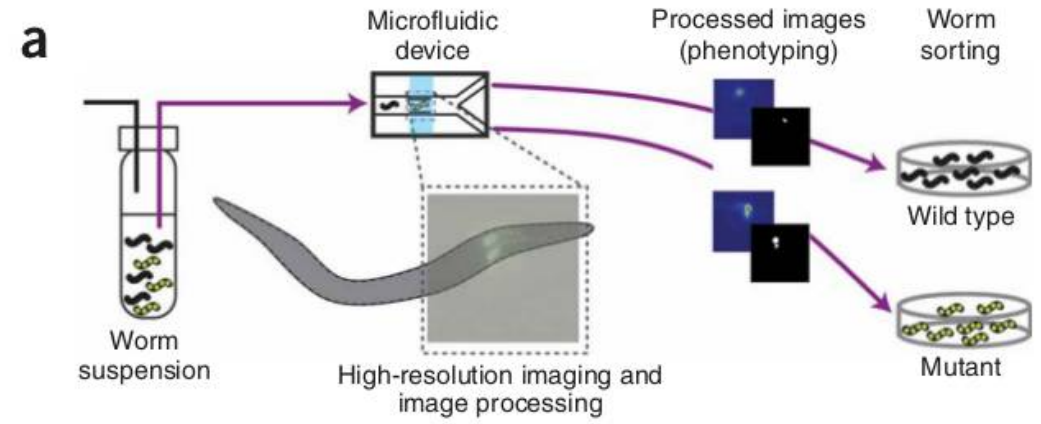
Kwanghun Chung[1,3], Matthew M Crane[2,3] & Hang Lu[1,2]

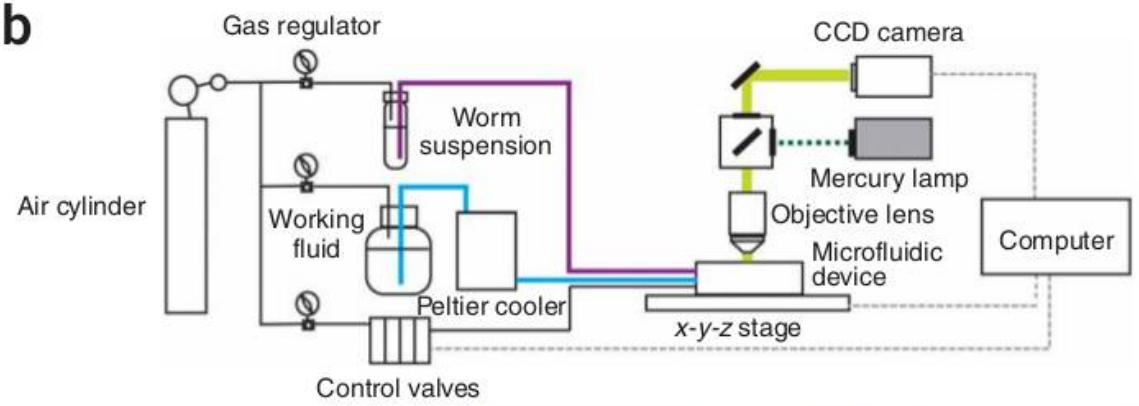
NATURE METHODS | VOL.5 NO.7 | JULY 2008 | 637

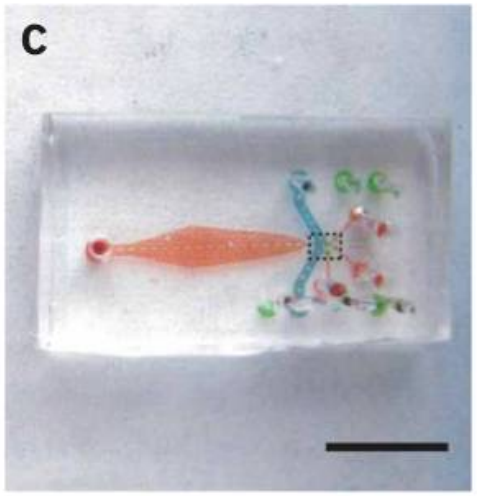
Noncontact microrheology at acoustic frequencies using frequency-modulated atomic force microscopy

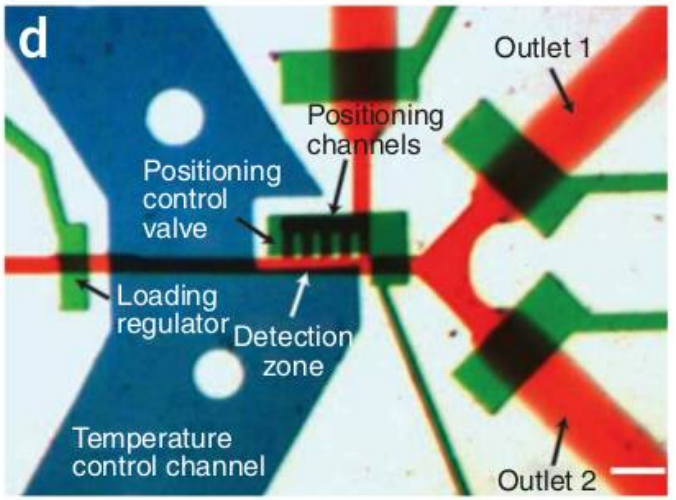
Núria Gavara & Richard S Chadwick

650 | VOL.7 NO.8 | AUGUST 2010 | NATURE METHODS









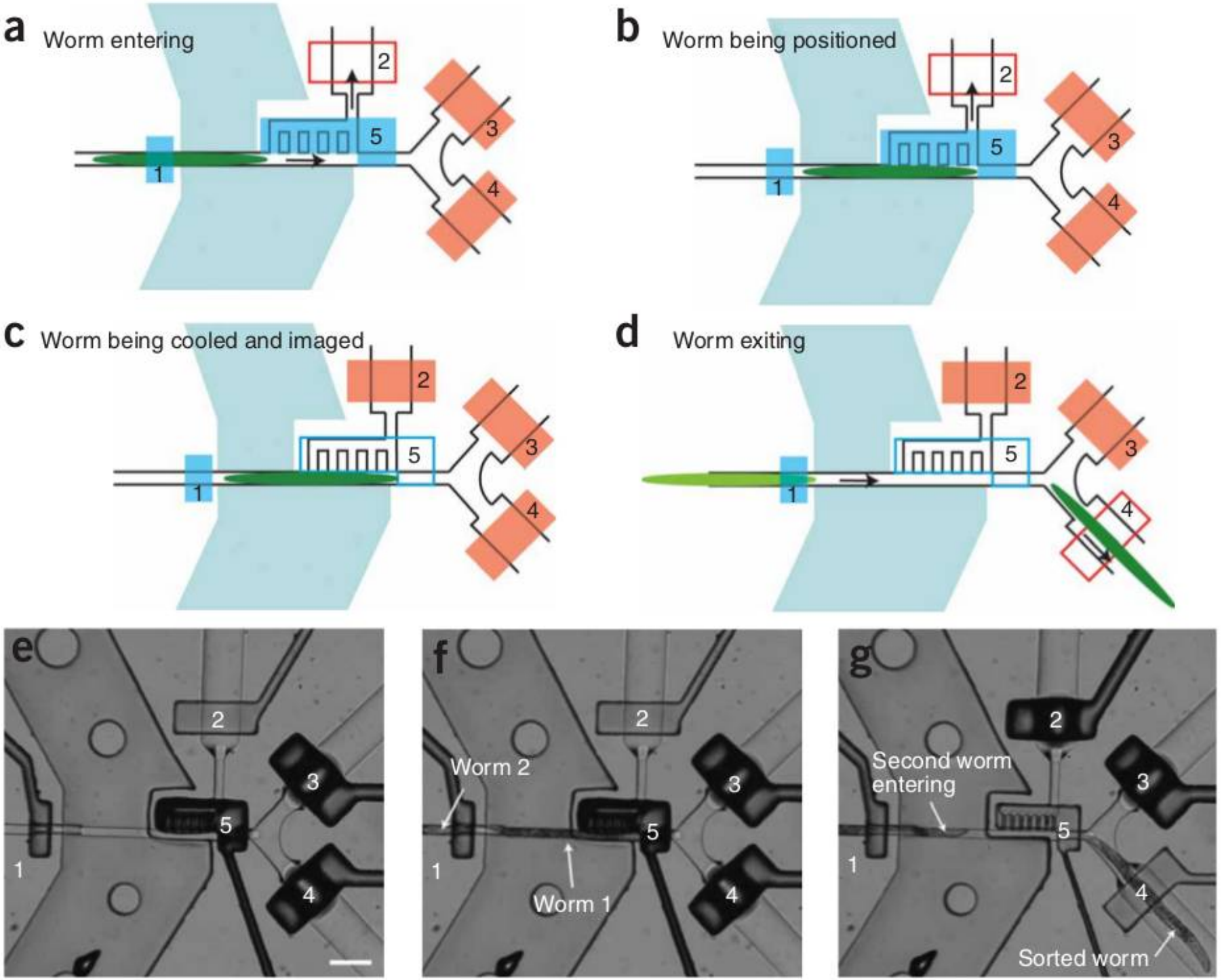
FACS for worms

Sort based upon complex reporter expression patterns.

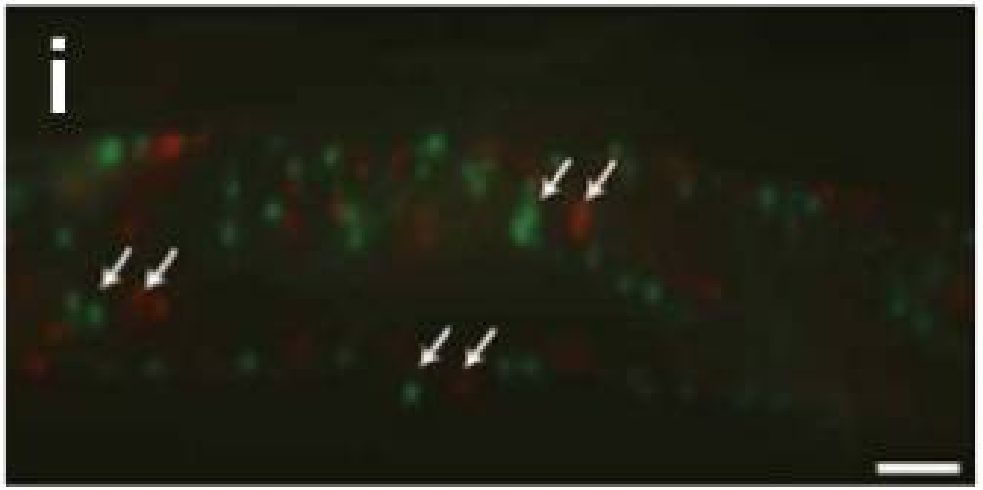
Two layer PDMS device
- worm layer
- valve/cooling layer

Important features...
- simple loading system
- reproducible worm placement
- worm cooling (vs. drugs/clamp)
- works on any microscope
- all features >20um

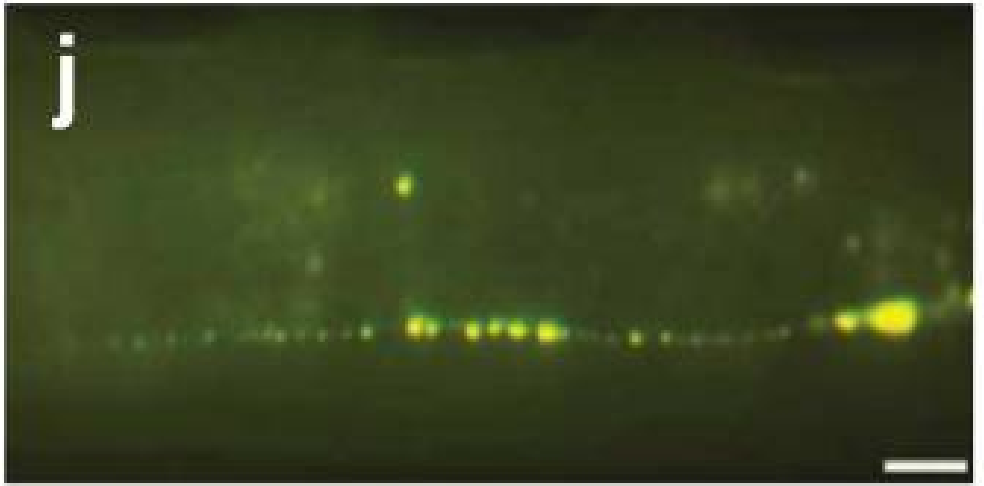
900 worms/hour (epi)
150 worms/hour (confocal)


a
Worm entering
1
2
3
4
5
b
Worm being positioned
1
2
3
4
5
c
Worm being cooled and imaged
1
2
3
4
5
d
Worm exiting
1
2
3
4
5
e
1
2
3
4
5
f
Worm 2
Worm 1
1
2
3
4
5
g
Second worm entering
Sorted worm
1
2
3
4
5

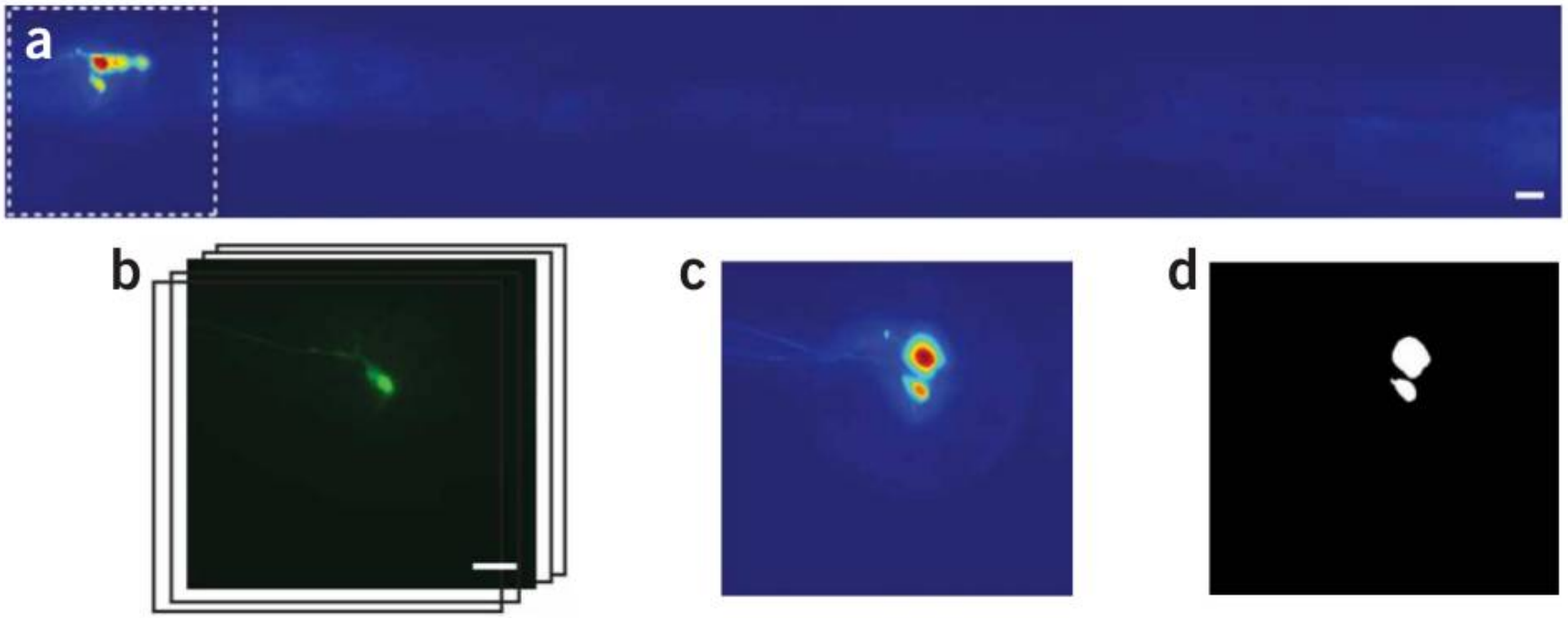
Frame 1: red
Wait 270 msec
Frame 2: green



Mechanical clamp



4C cooling



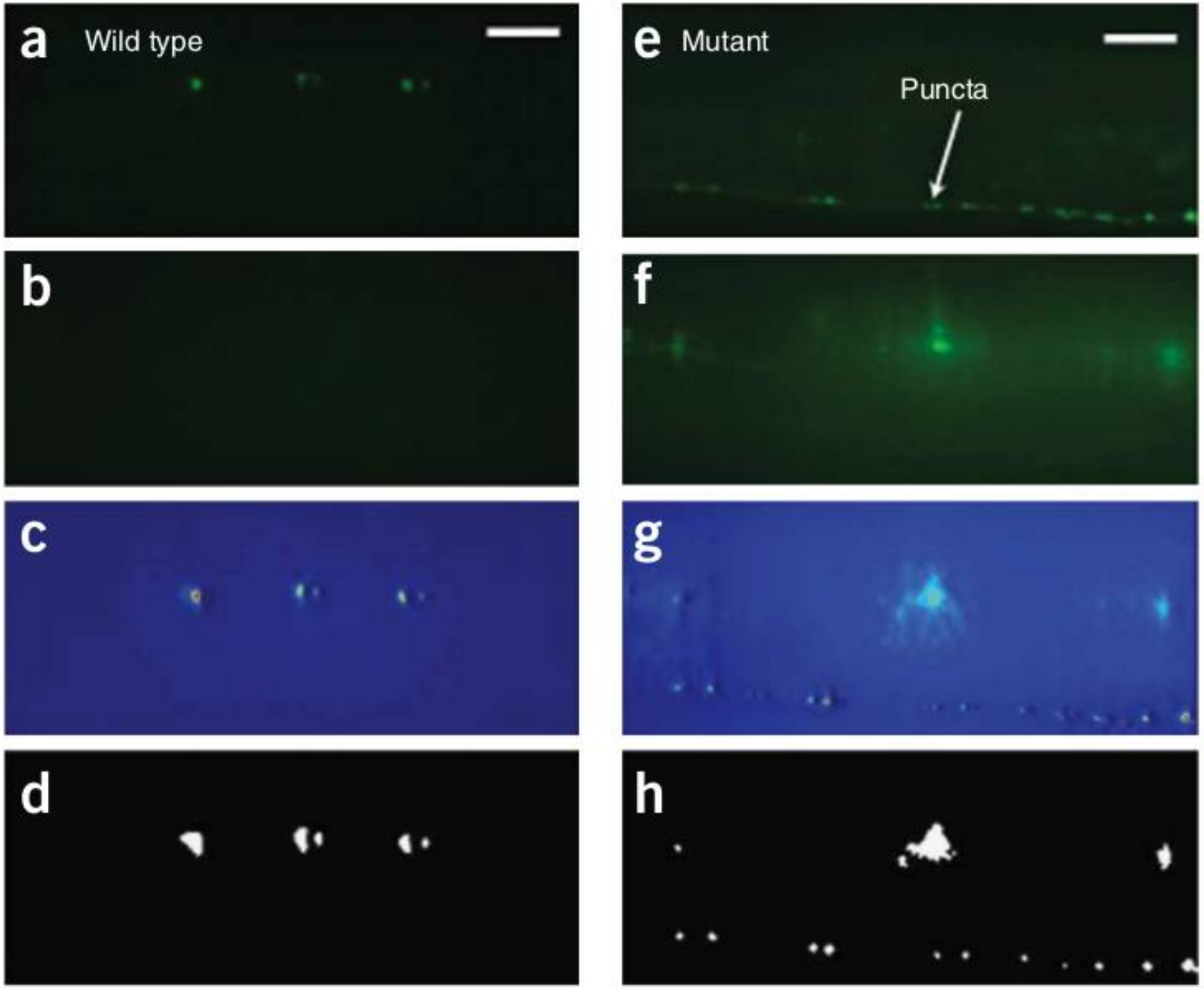
Confocal z-stack to determine number of AWC neurons expressing *pstr-2-gpf*.

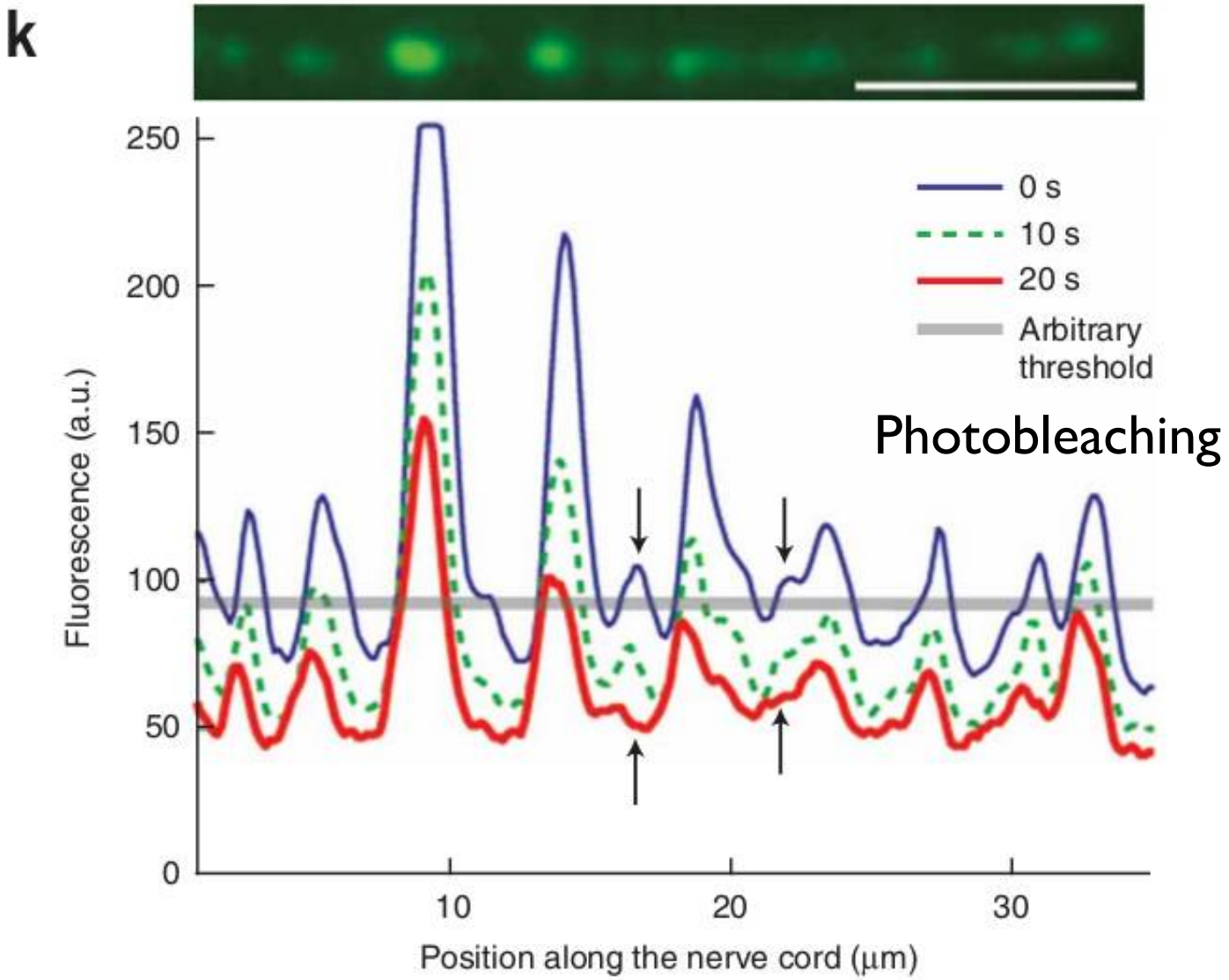
Focal plane 1

Focal plane 2

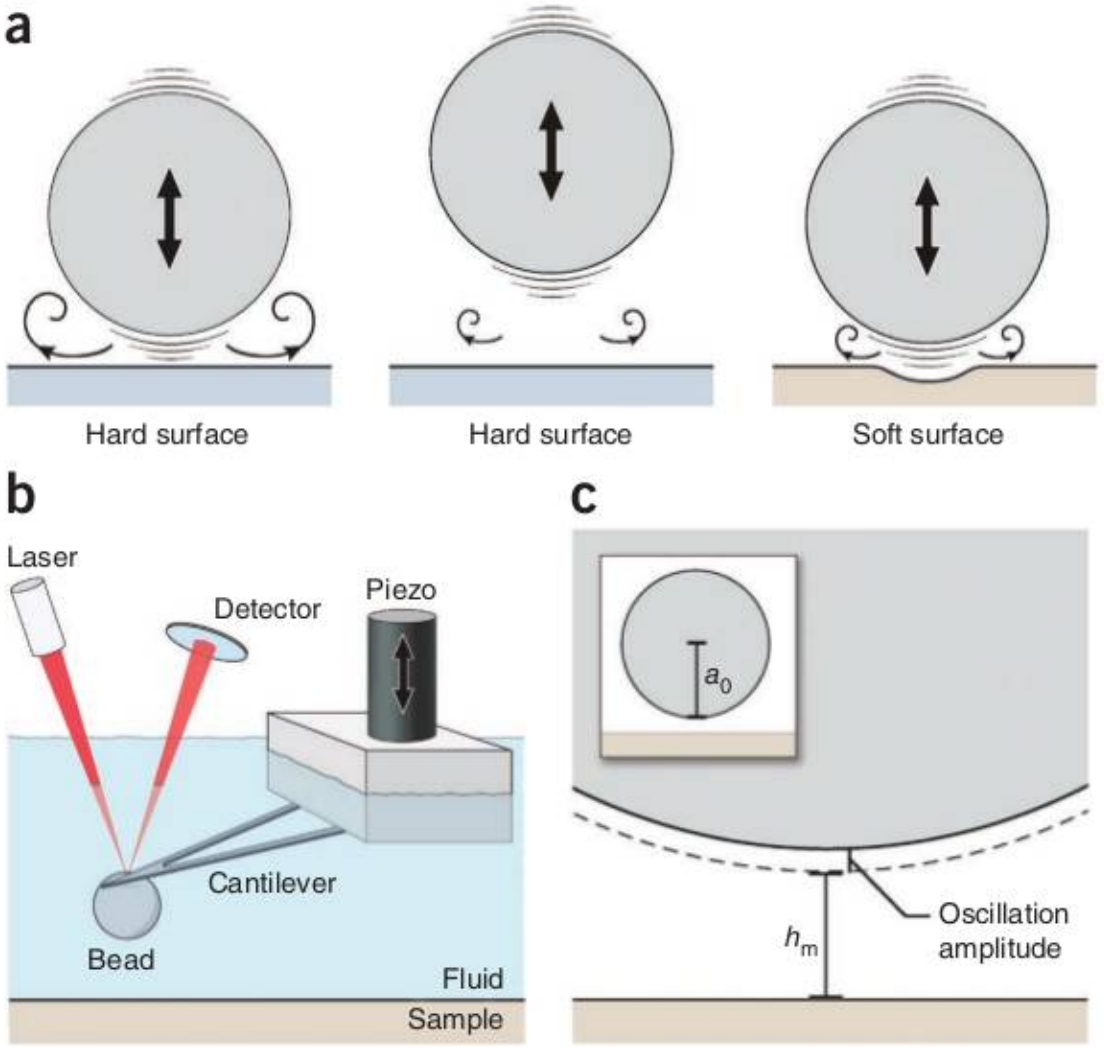
GFP intensity

Thresholded



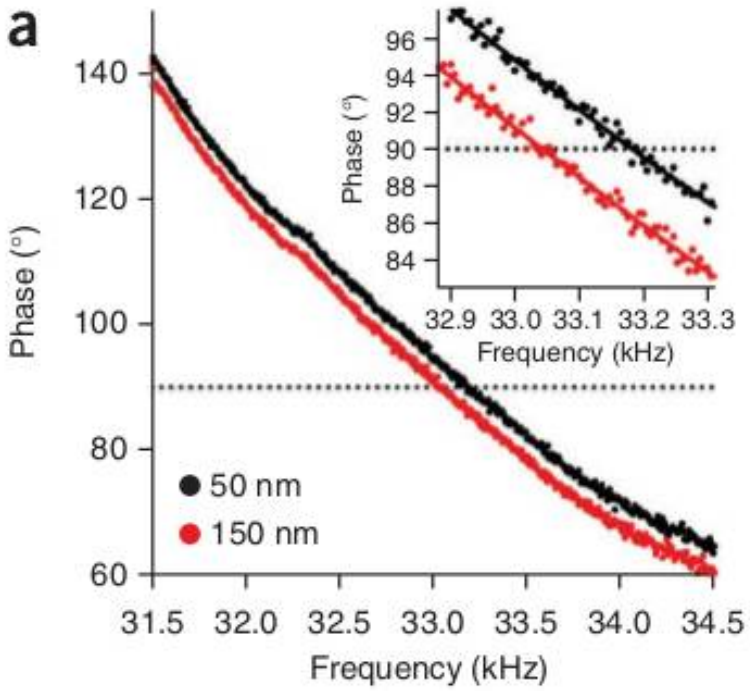


Photobleaching

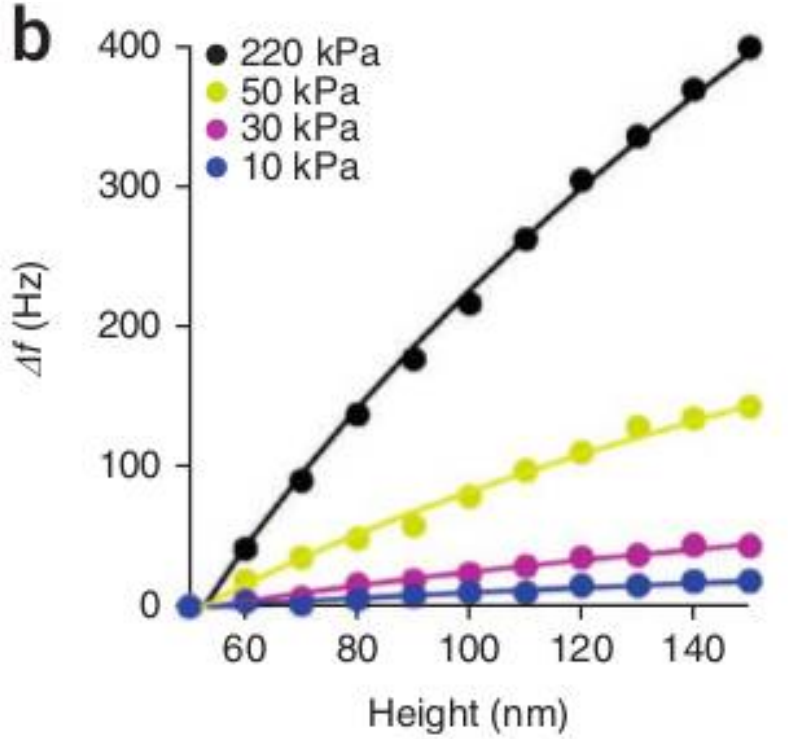


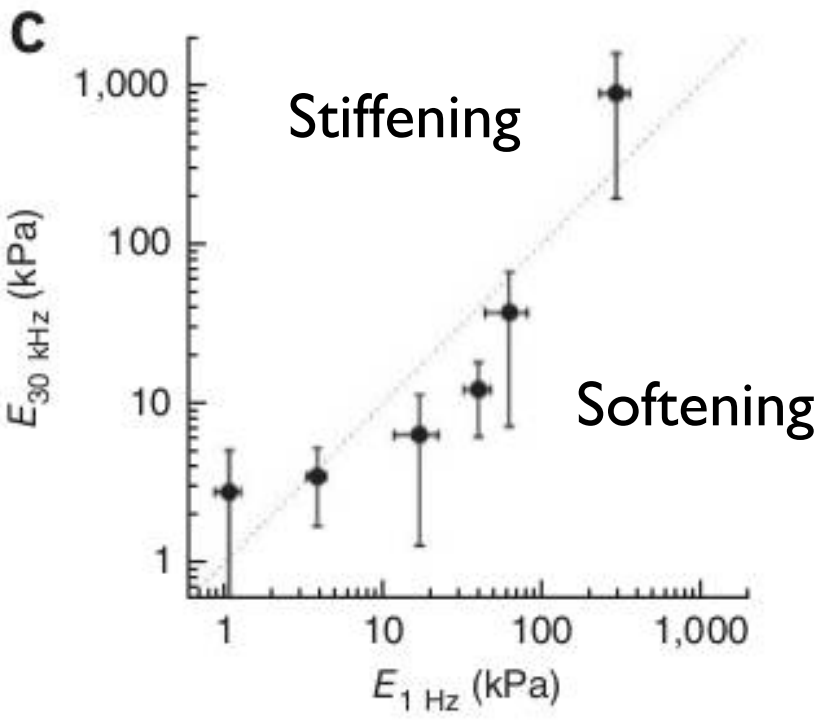
Measure soft material mechanics (10-200 kPa) based upon hydrodynamic forces on an AFM cantilever.

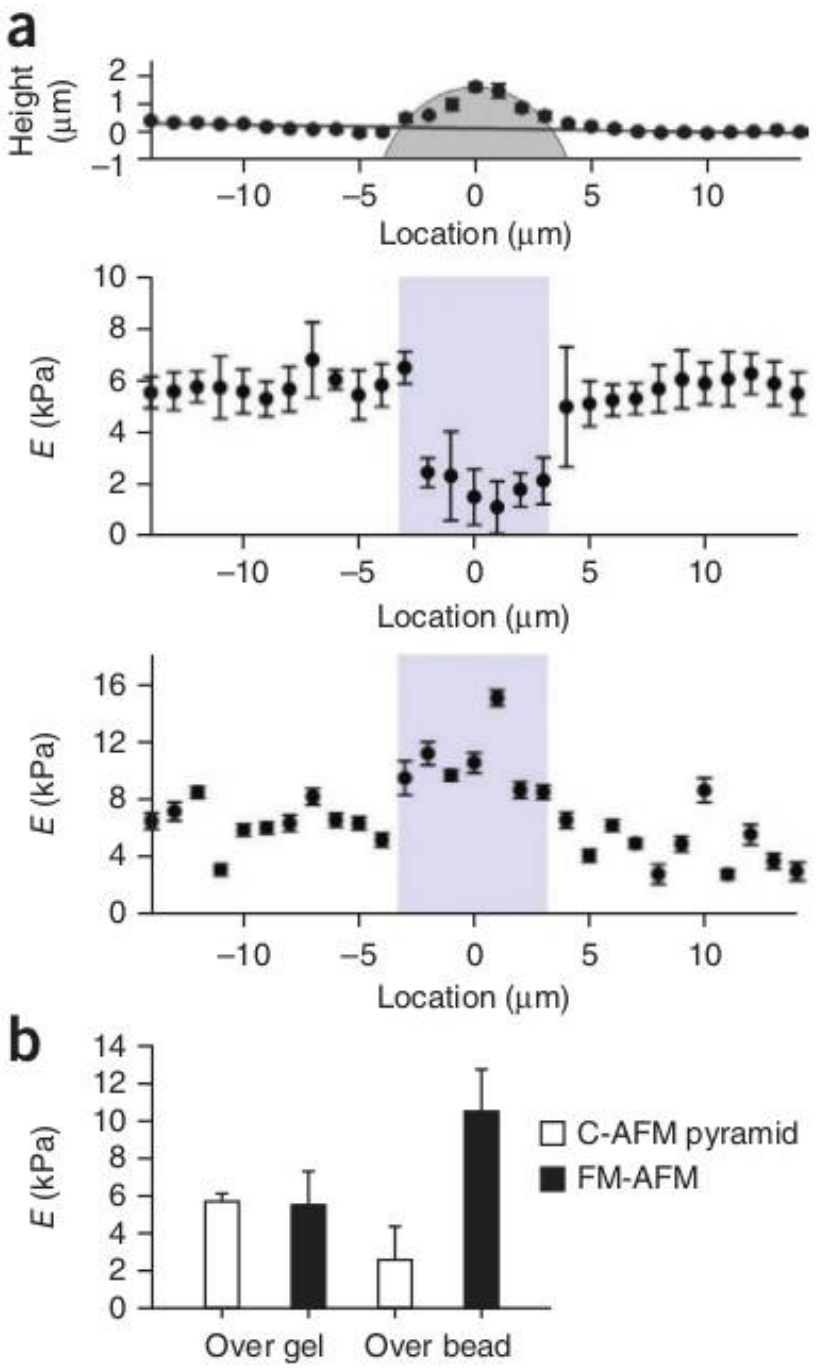
Developed at NIDCD lab to measure tectorial and basilar membrane mechanics at acoustic frequencies.



- Measure resonant frequency (90 degree phase) as a function of sample-bead gap.
- The stiffness of the squeezed film depends on the sample mechanics, and affects freq.







Bead embedded in 6 kPa gel

Contact mode F-D curve
(Forces ~ 1000 pN)

Oscillating bead
(Forces ~ 1 pN)

Bead measurements perturb the sample less than the conventional F-D curves.

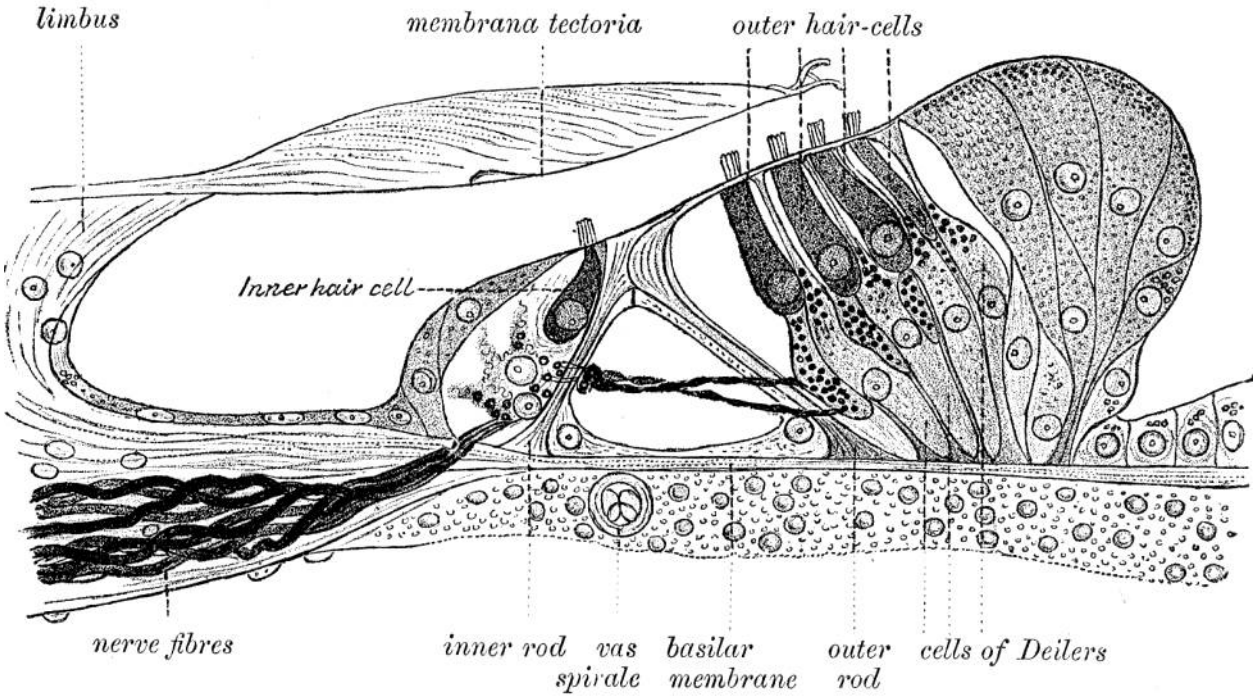


Table 1 | Viscoelastic properties of the tectorial membrane

Location	E (kPa)	μ_{eff} (Pa × s)	G' (kPa)	G'' (kPa)	Loss tangent (G''/G')
Apex	3.3 ± 2.3	0.007 ± 0.006	1.1 ± 0.8	1.3 ± 1.1	1.2 ± 1.9
Middle	5.7 ± 3.3	0.01 ± 0.008	1.9 ± 1.1	1.8 ± 1.5	0.9 ± 1.3
Base	14 ± 16	0.03 ± 0.04	4.7 ± 5.3	5.6 ± 7.4	1.2 ± 2.9

Data are mean ± s.e.m. (n = 4). One-way ANOVA reported significant differences in E (P = 0.006) and μ_{eff} (P = 0.007) along the length of the cochlea.