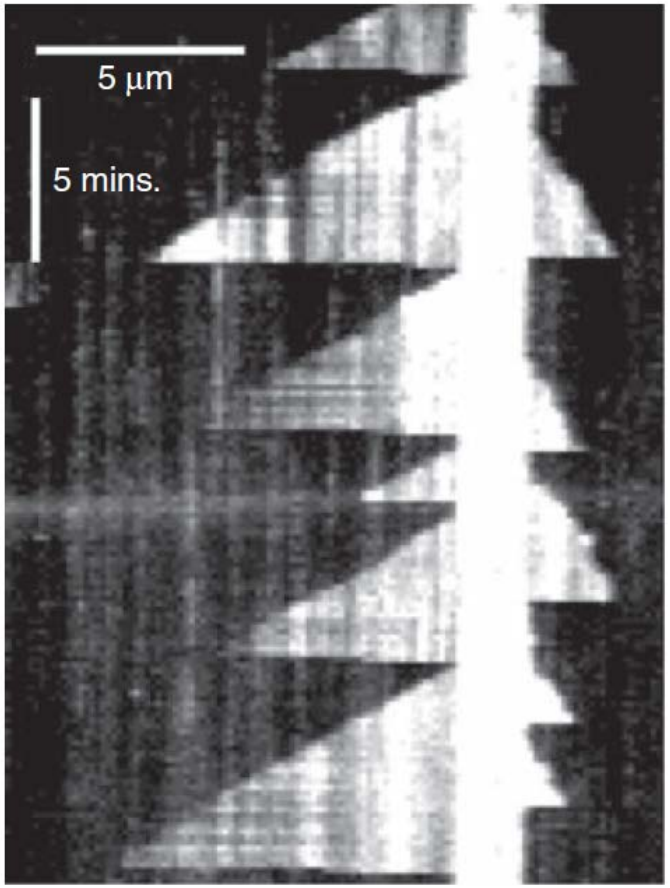
Putting theory into practice

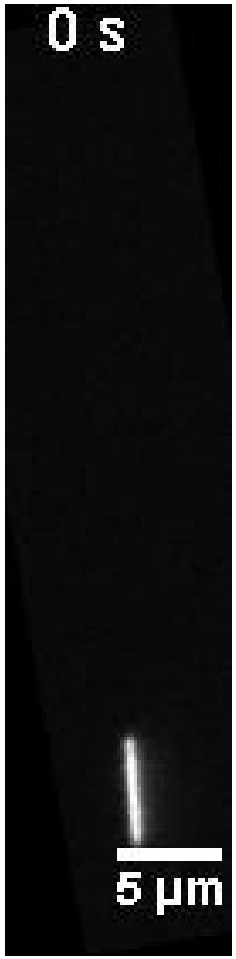
Examples from real experiments

Microtubule dynamics

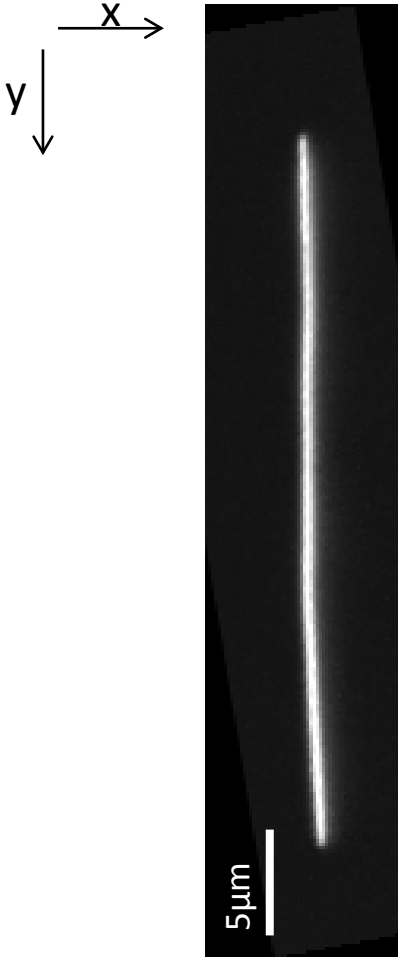


Gell et al., 2010

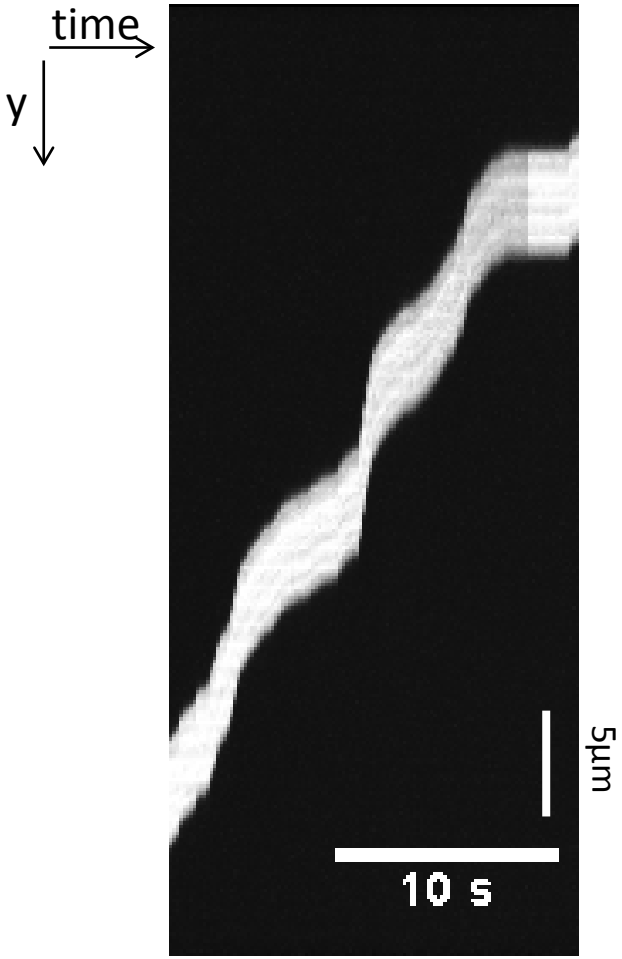
Gliding assay



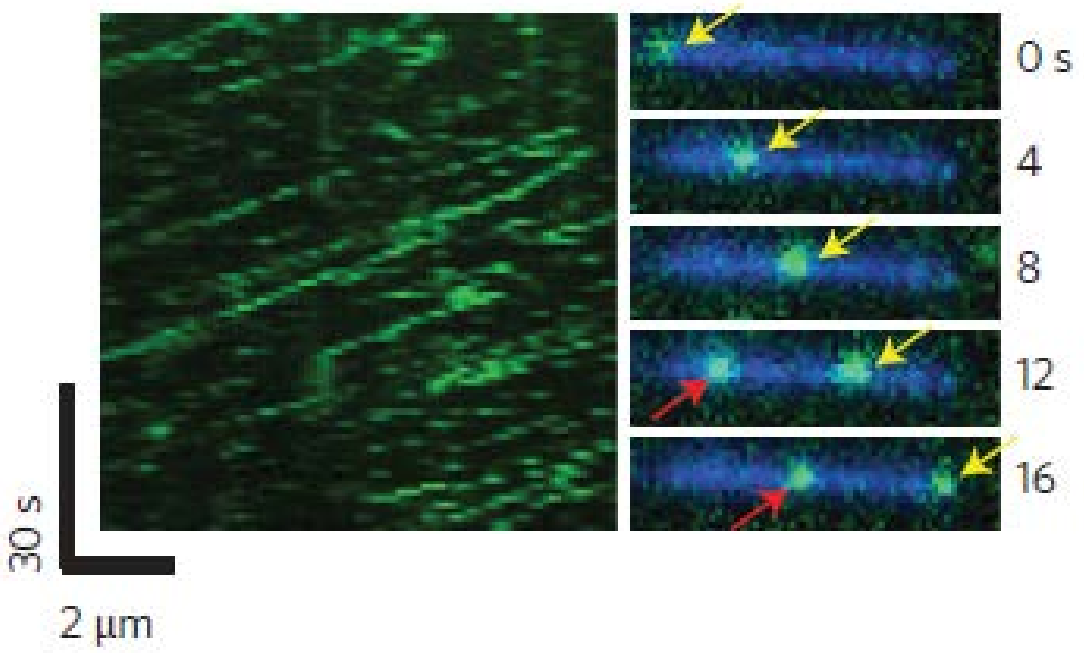
Maximum intensity projection

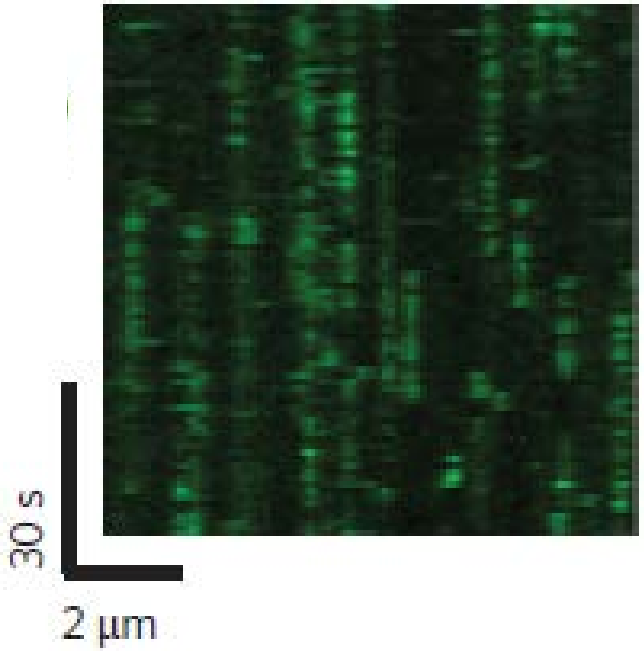


Kymograph



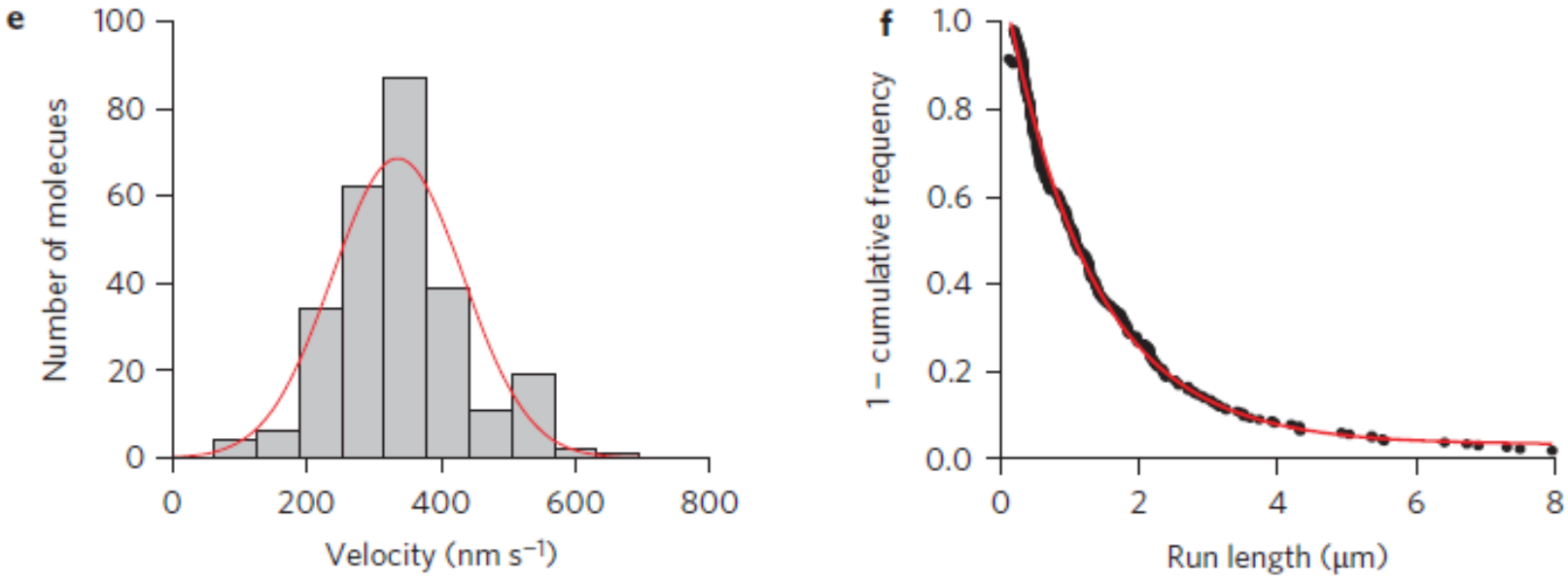
Stepping Assay





Kinesin 14 in plants, retrograde transport

Jonsson et al., 2015



Jonsson et al., 2015

Optical Tweezers

http://www.umass.edu/musclebiophy/techniques%20-%20laser%20trap.html

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Mechanics of Single Kinesin Molecules Measured by Optical Trapping Nanometry

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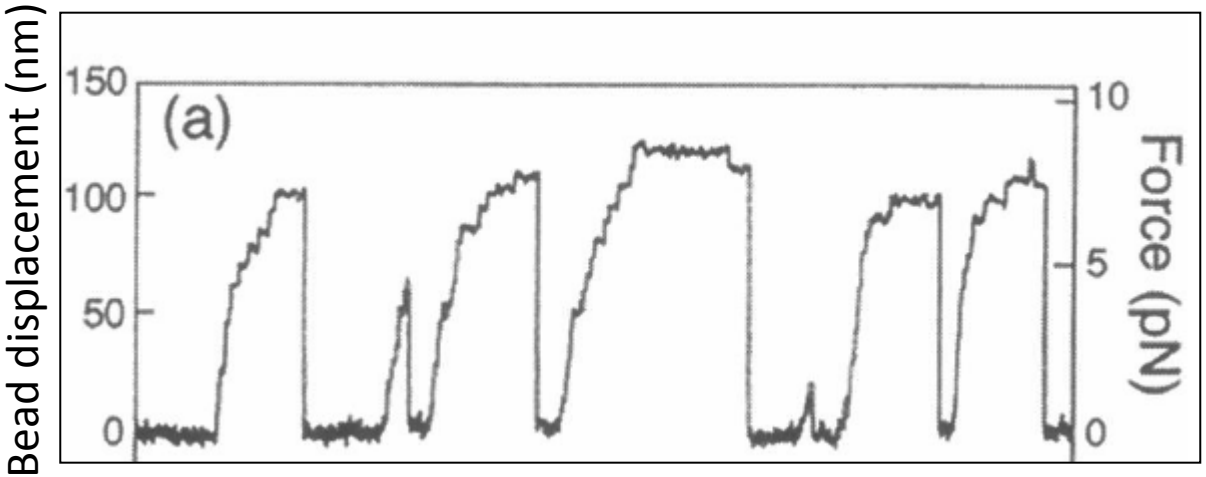
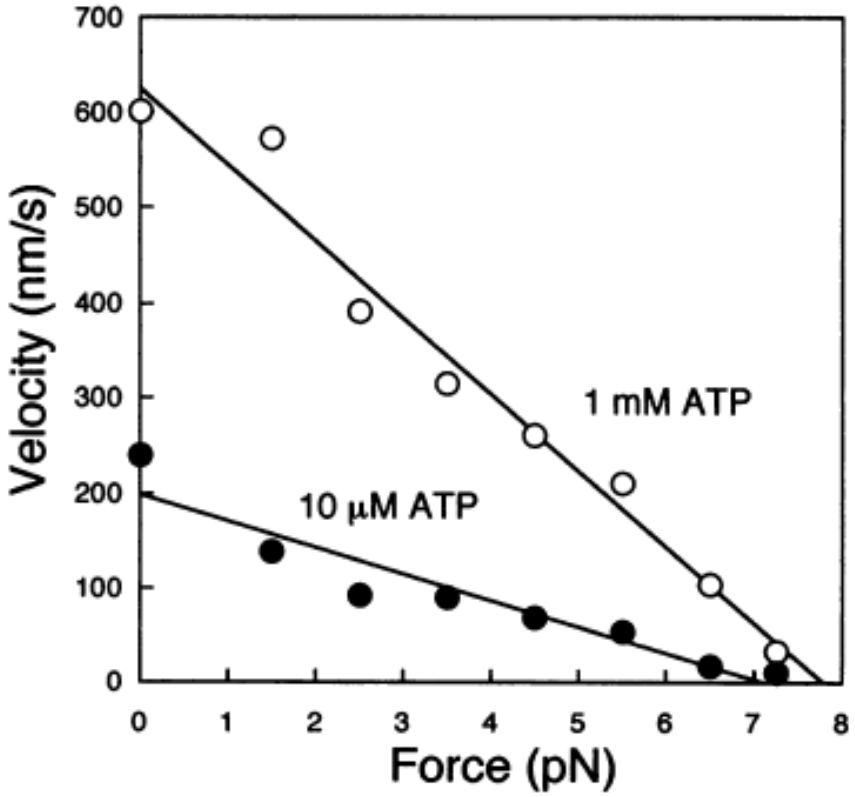
ABSTRACT We have analyzed the mechanics of individual kinesin molecules by optical trapping nanometry. A kinesin molecule was adsorbed onto a latex bead, which was captured by an optical trap and brought into contact with an axoneme that was bound to a glass surface. The displacement of kinesin during force generation was determined by measuring the position of the beads with nanometer accuracy.

. The force-velocity curves were linear from 0 to a maximum force at 10 μM and 1 mM ATP, and the maximum force was ~7 pN, which is larger by ~30% than values previously reported. Kinesin exhibited forward and occasionally backward stepwise displacements with a size of ~8 nm. The histograms of step dwell time show a monotonic decrease with time. Model calculations indicate that each kinesin head steps by 16-nm, whereas kinesin molecule steps by 8-nm.



Force-velocity relation



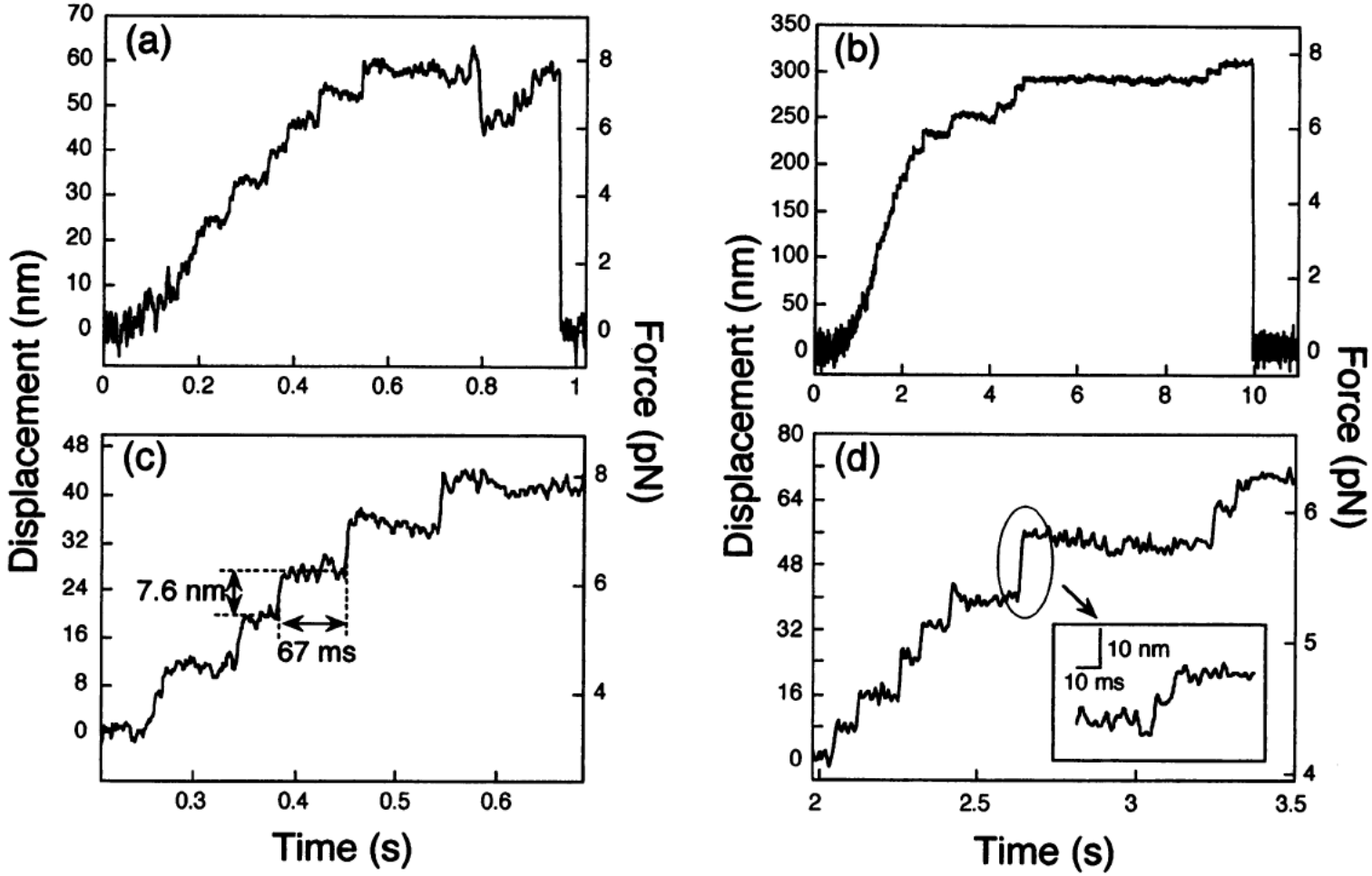
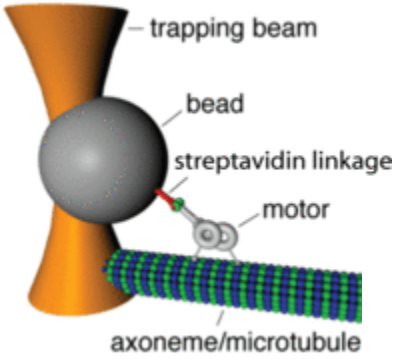
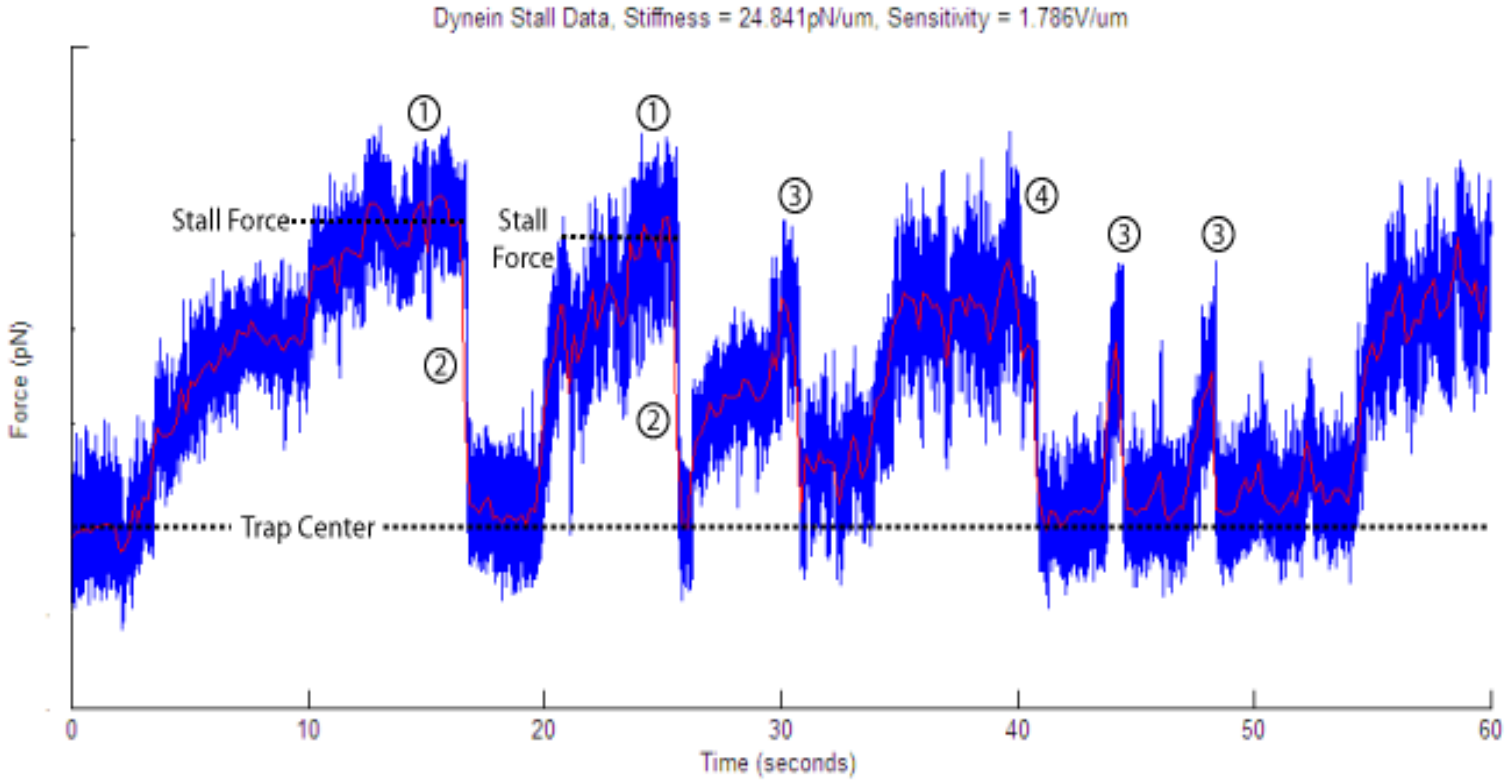
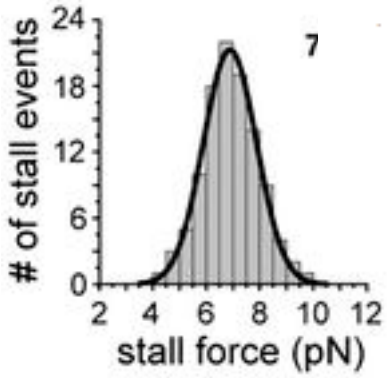


FIGURE 7 Stepwise movements of beads at 1 mM ATP (*a*) and 10 μM ATP (*b*). In *c* and *d*, displacements that express kinesin movement are corrected from *a* and *b*, respectively, by using the attenuation factor as shown in Fig. 5 *e*. The force was calculated from the trap stiffness and bead displacement. Trap stiffness: (*a*) 0.13 pN/nm; (*b*) 0.025 pN/nm. Filters used in the displacement: (*a* and *c*) 100-Hz low-pass filter; (*b* and *d*) 50-Hz low-pass filter. (*d, inset*) 250-Hz low-pass filter. The step size, shown in figures, was measured from the differences in the averages of the displacements between the steps. The time in *c* indicates the dwell time. Dwell time was measured between steps when displacements were half of the unitary steps.



Dynein stall forces





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