**Supplementary Table 1.** List of parameters used in the paper

Parameter Significance

*L* Effective length of filament (MT or flagellum)

*db* Optical bead separation

Strain computed from optical bead separation

*s* Arc-length coordinate along the filament

Normalized arc-length coordinate along the filament

*b* Optical bead radius

*F* Force required to deform the filament

*Fc* Classical buckling force for a beam

*B* Flexural rigidity

*R* Undeformed MT radius

*a* Semi-minor axis of MT cross-section

*e* Cross-sectional “eccentricty”

*N* Number of particles used to discretize a filament

Friction coeffcient

Mechanical relaxation time for filament

*Ec* Circumferential Young’s modulus

*Ea* Axial Young’s modulus

*G* Shear modulus

*MB* Critical bending moment at the onset of Brazier buckling

*h* MT “equivalent” thickness

*h*0 MT “effective” thickness

*p* (*lc* ) Rest (deformed) length of circumferential MT bonds in simulation

*d* (*la*) Rest (deformed) length of axial MT bonds in simulation

Local circumferential bending angle in simulation

Local axial bending angle in simulation

Local shear angle in simulation

*kc* Circumferential stretching spring constant

*ka* Axial stretching spring constant

Circumferential bending “spring” constant

Axial bending “spring” constant

Shear “spring” constant