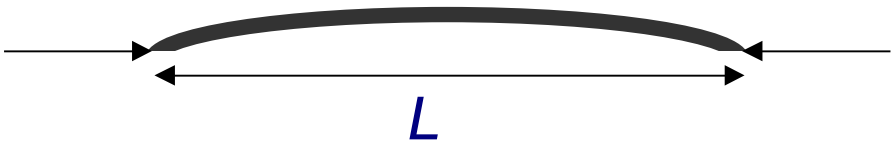
CHARACTERISTICS OF FILAMENTS

HOW THICK IS A BIOLOGICAL ROD?



BUCKLING FORCE = $\pi^2 Y I / L^2$

Y = YOUNG'S MODULUS ~ 10^9 J/m^3

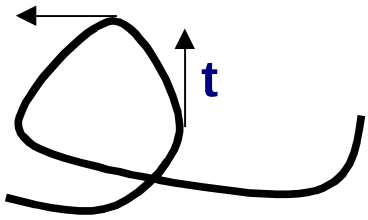
$I = \pi R^4/4$ FOR SOLID RODS

FOR A TYPICAL FORCE OF 5 pN AND LENGTH 5 µm

R = 11 nm

MICROTUBULES ARE COMPRESSIVE RODS

FILAMENTS IN THE CELL



$< \mathbf{t}_o \bullet \mathbf{t}_s > = \exp(-s / \xi_P)$

PERSISTENCE LENGTH = $\xi_P = Y I / k_B T$

FILAMENT	ξ_P (nm)
SPECTRIN	10-20
F-ACTIN	10-20 x 10^3
MICROTUBULES	1-6 x 10^6

(MEASURED VALUES CONSISTENT WITH $\xi_P = R^4$)