Modeling project: Formin speed

Physics of Complex Systems M2 – Biophysics

Formin is a ring-shaped protein dimer that associates with the barbed end of actin filaments as they polymerize or depolymerize, sliding along the filament to remain at its tip as monomers are added or removed (Fig. 1). In the experiment presented here, formin is associated with the bottom of a microfluidic channel while a fluid flow pulls the existing filament to the right as represented on the right of Fig. 1. As shown in Fig. 2, if the channel is filled with a set concentration of actin monomers, the magnitude of the force influences the polymerization rate of the filament. If the channel is void of actin monomers, the filament spontaneously depolymerizes, also in a force-dependent manner.

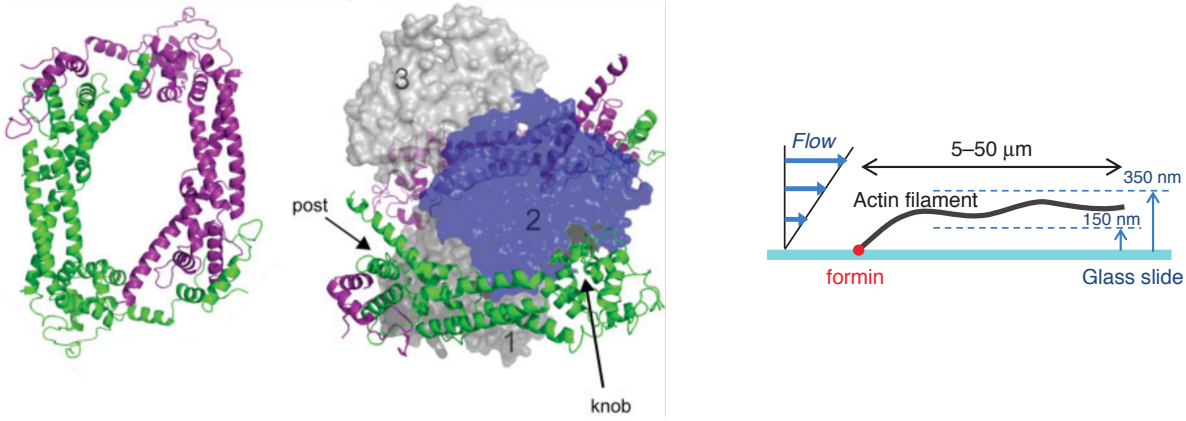

Figure 1: Left: structure of the formin dimer. Middle: representation of the association of that formin dimer with the barbed end of an actin filament. The three first actin monomers are labeled 1, 2 and 3. In a real system the system, the filament extends further with a monomer number 4, 5 *et caetera* up to a large number numbering in the hundreds or thousands. If monomer 1 is removed, forming shifts up to remain associated with the end of the filament, and similarly if a monomer "0" is added. Right: Geometry of the microfluidics experiment.

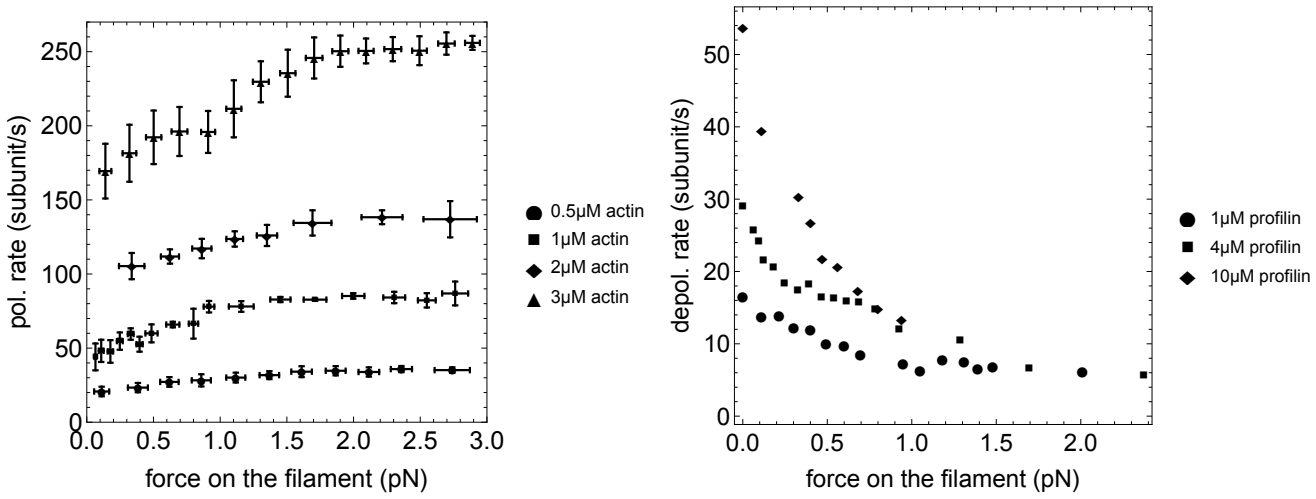

Figure 2: Force-extension curves from the experiment of Fig. 1. Bars are standard deviations. Profilin is a protein that binds to actin in its monomeric form. The polymerization data on the left uses a saturating concentration of profilin (*i.e.*, there is more than one profilin per actin in solution).