Entropic force production in cytoskeleton Network

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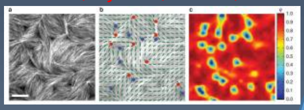
Abstract

cytoskeleton consists of protein and actin filaments, micro-tubules and intermediate filaments. The ability of a eukaryotic cell to withstand deformation, intracellular cargo transport and deformation during movement depends on the cytoskeleton, which is an interconnected network of filamentous polymers and regulatory proteins. The functions of these molecules depend on ATP. To understand the mechanistic models that describe complex cellular behaviors, it is necessary to understand the basic physical principles that regulate the dynamics of these networks and the dynamics of these entropy properties.

Method

The choice of these methods depends on the goals of the researchers and the type of research , if a structural study is performed, spectroscopic methods such as : fluorescence, CD, and microscopy such as AFM, SEM, TEM are used. factors, for computational work. The choice of modeling and simulation also depends on the type of analysis. Several types of simulation methods and software used in these studies include: FE Method, MD, Cytosin, Matlab, and others .

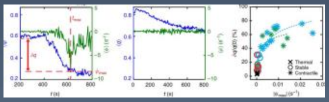


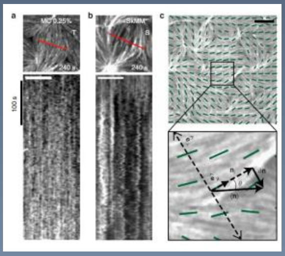
Experimental Method:

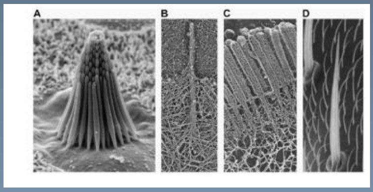
- Fluorescence
- CD
- microscopy such as AFM, SEM, TEM

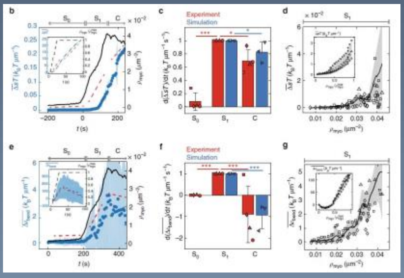
Simulation Method:

- FE Method,
- MD,
- Cytosin,
- Matlab,



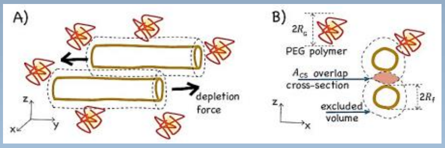






Result and Discussion

The combination of experimental and theoretical developments in in vitro model systems has provided fundamental insight into the possible mechanical mechanisms of cellular response. They are also unique in two important physical properties, the stability of LP and the size of a single monomer Ecto myosin dynamics involves myosin-induced curves in both Nematic orientation and F-Actin density . Increasing actin density indicates an increase in its activity. In addition to this, the formation of cytoskeleton clusters as well as a decrease in their accessible surface increase the entropy. Entropy and its rate of production can be a measure of how much system equilibrium and how much energy is wasted. The flexural energies increased with the addition of myosin filaments, which also did not increase the entropy activity uniformly with increasing ac



Entropy production

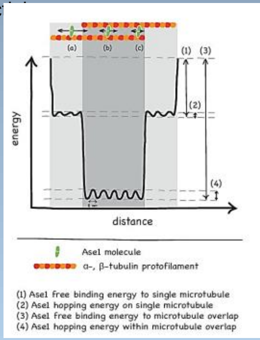
- The formation of cytoskeleton clusters
- decrease in their accessible surface increase
- Increasing actin density
- Depletion force

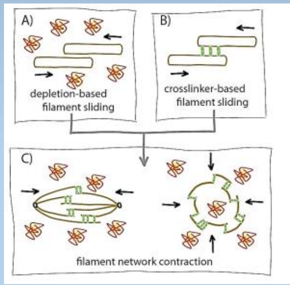
$$H_j[r_j, \Delta\bar{u} = \Delta\bar{u}^*] = q_j^4 r_j^2 \left[\frac{1}{2} N\kappa_f + \frac{M^2 E_f A_f (d_f + t)^2 (4M^2 - 1)}{6 + \frac{(q_j L)^2 M(2M+1)}{\alpha}} \right],$$

$$\Delta S = nC_v \ln\frac{T}{T_0} + nR\ln\frac{V}{V_0}.$$

Similarly if the temperature and pressure of an ideal gas both vary,

$$\Delta S = nC_P \ln\frac{T}{T_0} - nR\ln\frac{P}{P_0}.$$





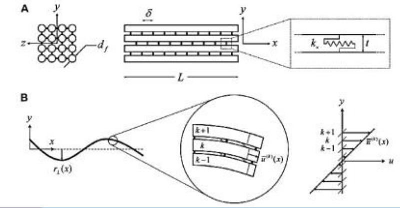


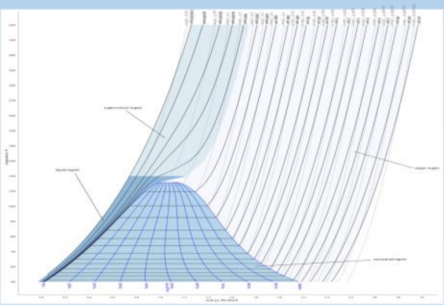
FIGURE 2 Theoretical bundle model. (A) Cross-linked fiber bundle with $N = 16$ fibers. Discrete cross-links couple nearest-neighbor fibers mechanically in stretching and bending. (B) (left) Deformed backbone of a fiber bundle subject to in-plane bending; (middle) close-up view of three typical fibers showing fiber and cross-link deformations in (faded gray lines) decoupled and (solid black lines) fully coupled bending; (right) transverse distributions of fiber axial displacement, $u^{(k)}(x, y)$, and (arrows) mean axial displacement, $\bar{u}^{(k)}(x)$ in (faded gray lines) decoupled and (solid black lines) fully coupled bending.

$$dS_{MTD} = \left[(dS)_{TD} \rightleftarrows (d_i S)_{TF} \right] =$$

$$= \Lambda_{TD\backslash TF} \left[\left(\frac{dU + pdV}{T} - \frac{1}{T} \sum_{1}^{n} \mu dN_k \right)_{TD} + \left(\gamma_1^{(w)} \frac{\omega_\Sigma}{T_\Sigma} dV_{P\gamma} \right)_{TF} \right] \uparrow, \Lambda \gtreqless 1.$$

Conclusion

The entropy and the rate of its production indicate the equilibrium and energy loss. Anthropic production is caused either by the factors surrounding the strings or by the diffuse cross linkers limited to the overlap of the strings. Anthropic mechanisms can create stronger force generation mechanisms that result from chemical energy or can be a factor in equilibrium when opposing forces are close to equilibrium [4]. The anthropic power generation mechanisms discussed here can therefore play an important role in organizing interdisciplinary networks and should be considered when formulating comprehensive explanations of the dynamics of interdisciplinary networks.



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