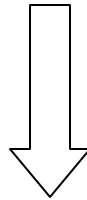


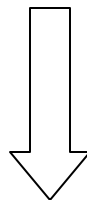
**Why Are the Physical Properties
of Biomolecules Important?**

Genetic Information Acts Like a Digital Code: Long Timescales

3'-ATA-GAT-AGA-TAG-ATA-GAT-5'

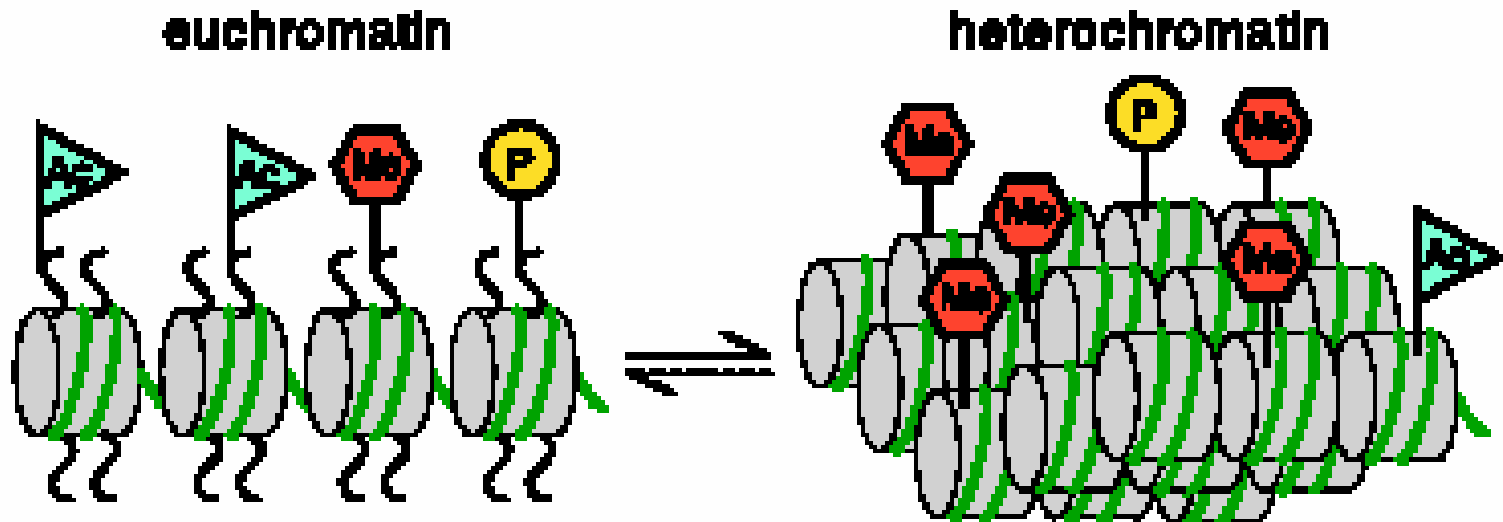


5'-UAU-CUA-UCU-AUC-UAU-CUA-3'



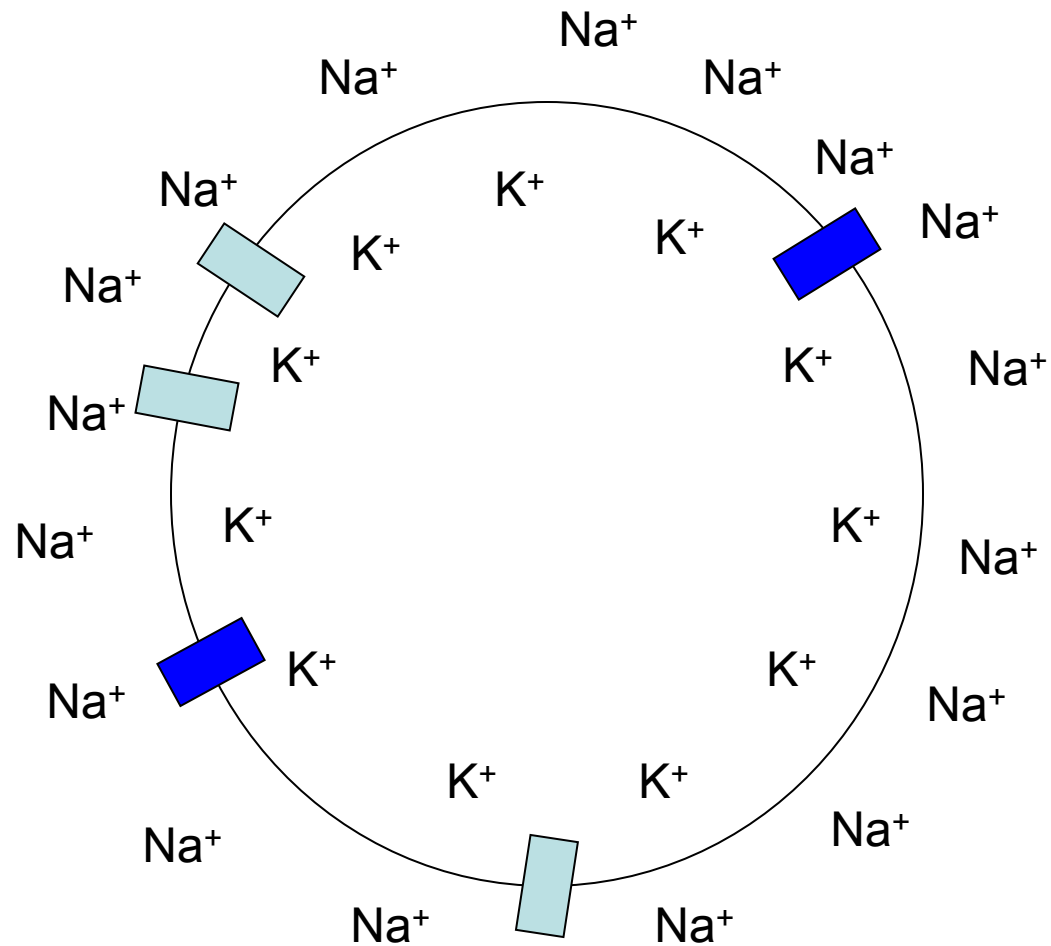
N-Tyr-Leu-Ser-Ile-Tyr-Leu-C

Histone Code: Intermediate Timescale

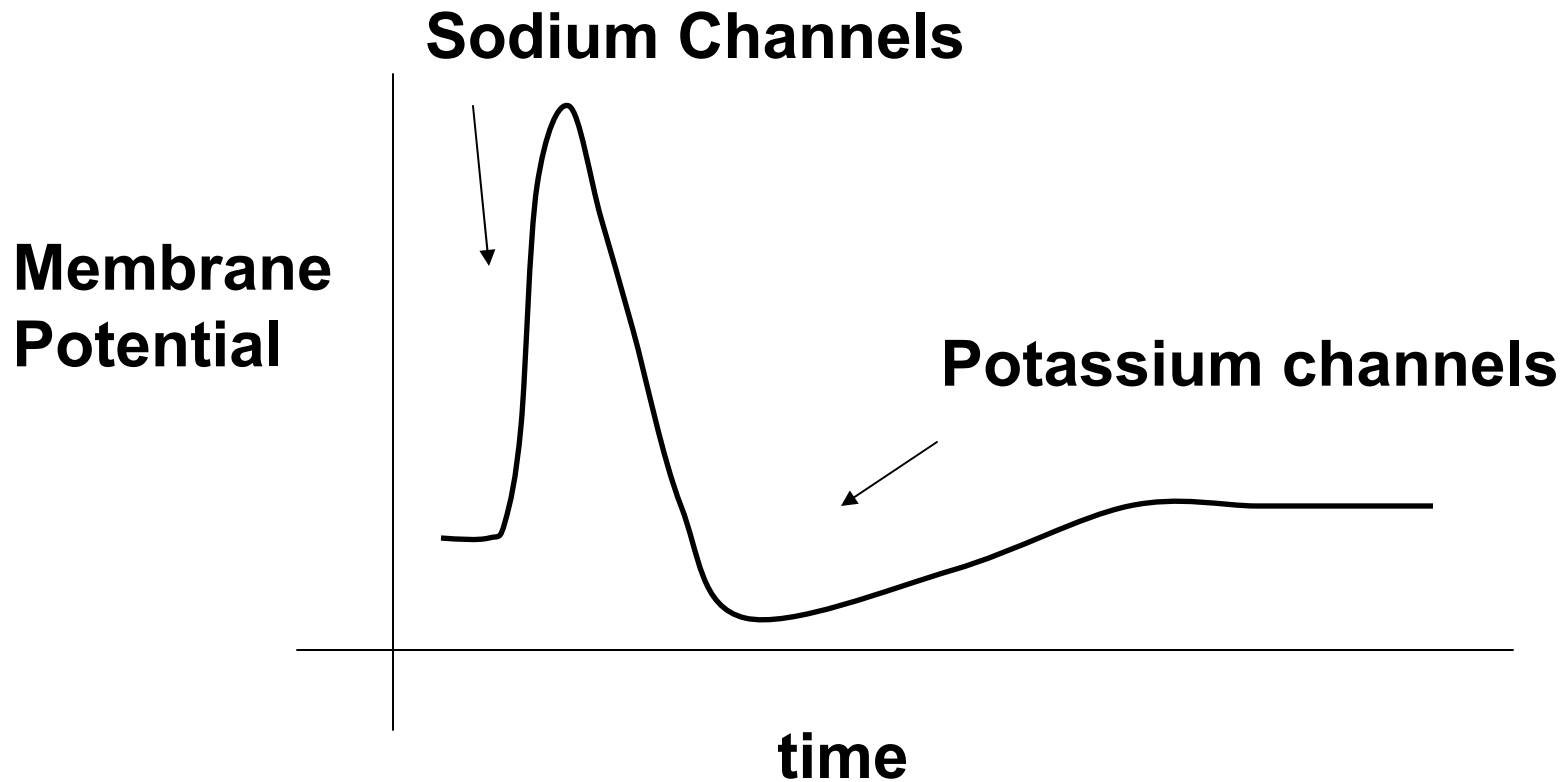


Jenuwein and Allis, *Science* **293** 1074 (2001)

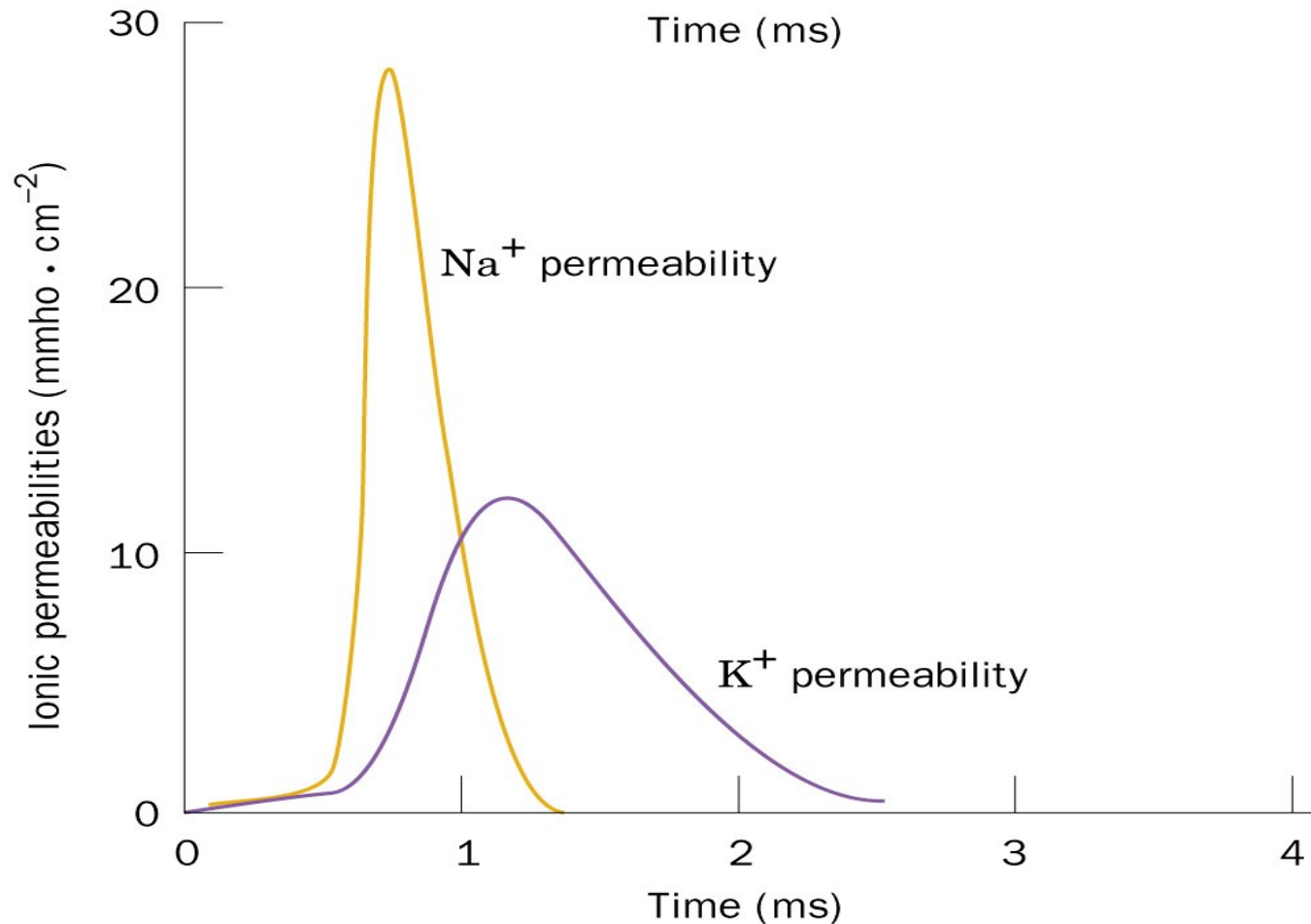
Membrane Potential: Fast Timescale



Channel Kinetics Determine the Shape of the Action Potential

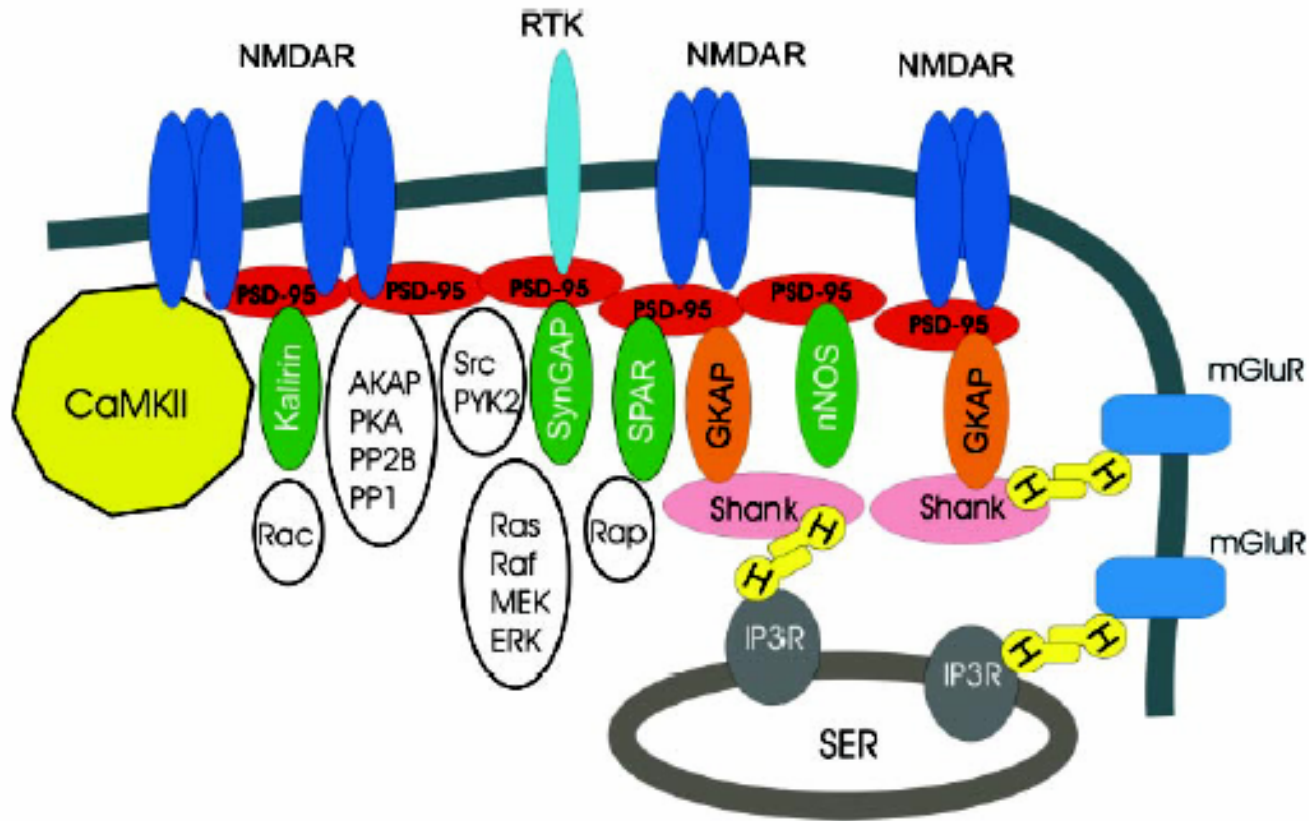


Rates of Protein Conformational Changes Shape the Action Potential



Voet and Voet, *Biochemistry*

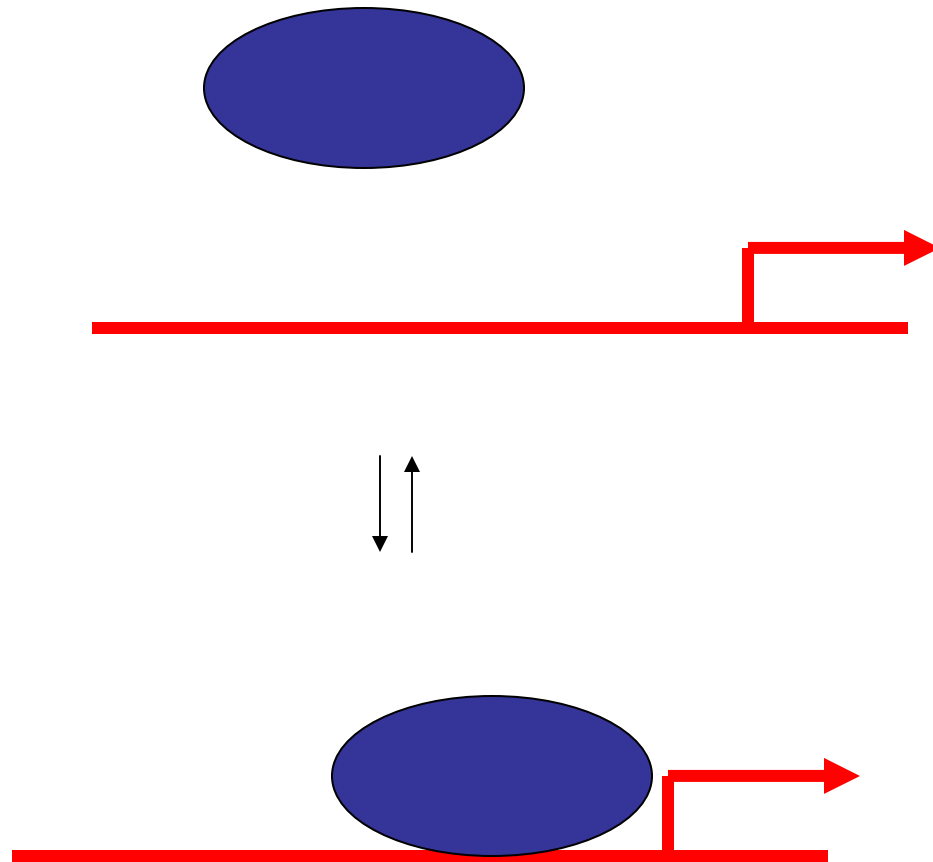
Molecules of the Post-Synaptic Density



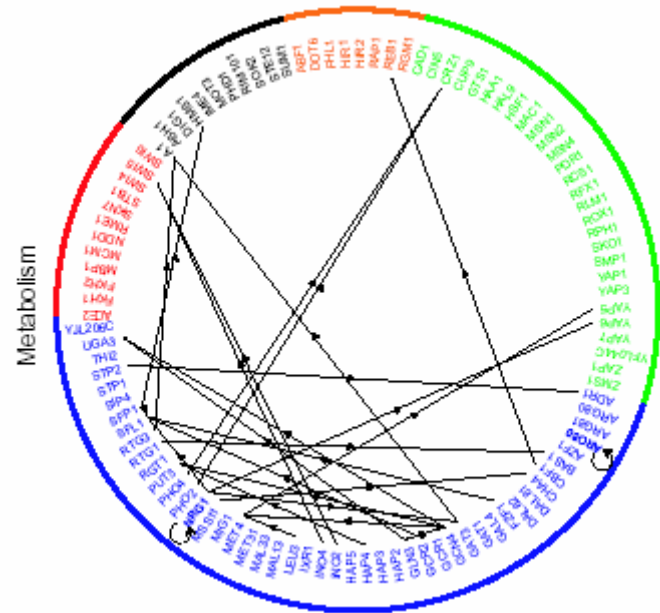
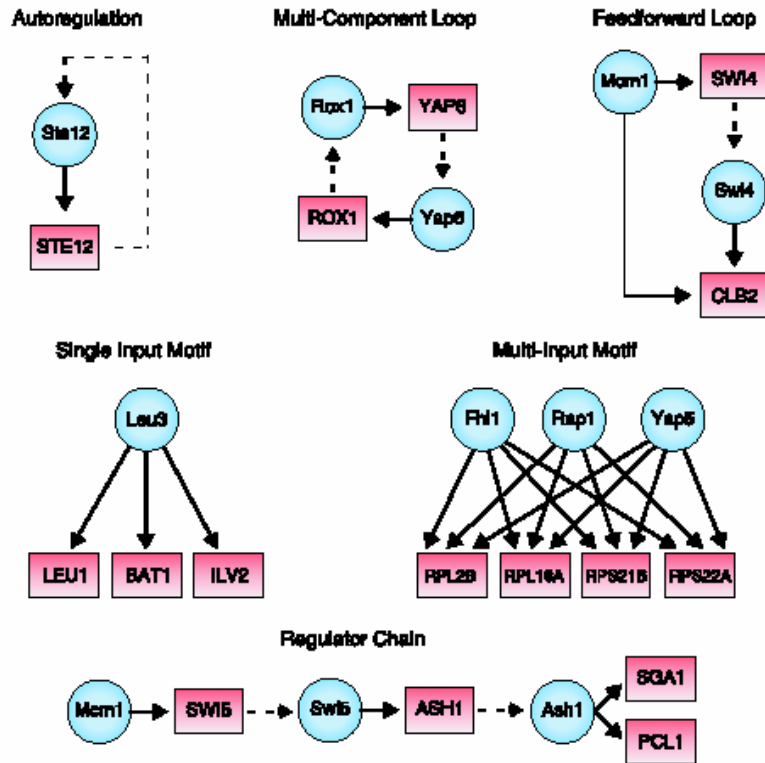
Sheng, M. and Kim, M.J. *Science* 298 776 (1998)

Kinetics and Thermodynamics in Molecular Physiology

Thermodynamics and Kinetics of Protein-DNA Interactions

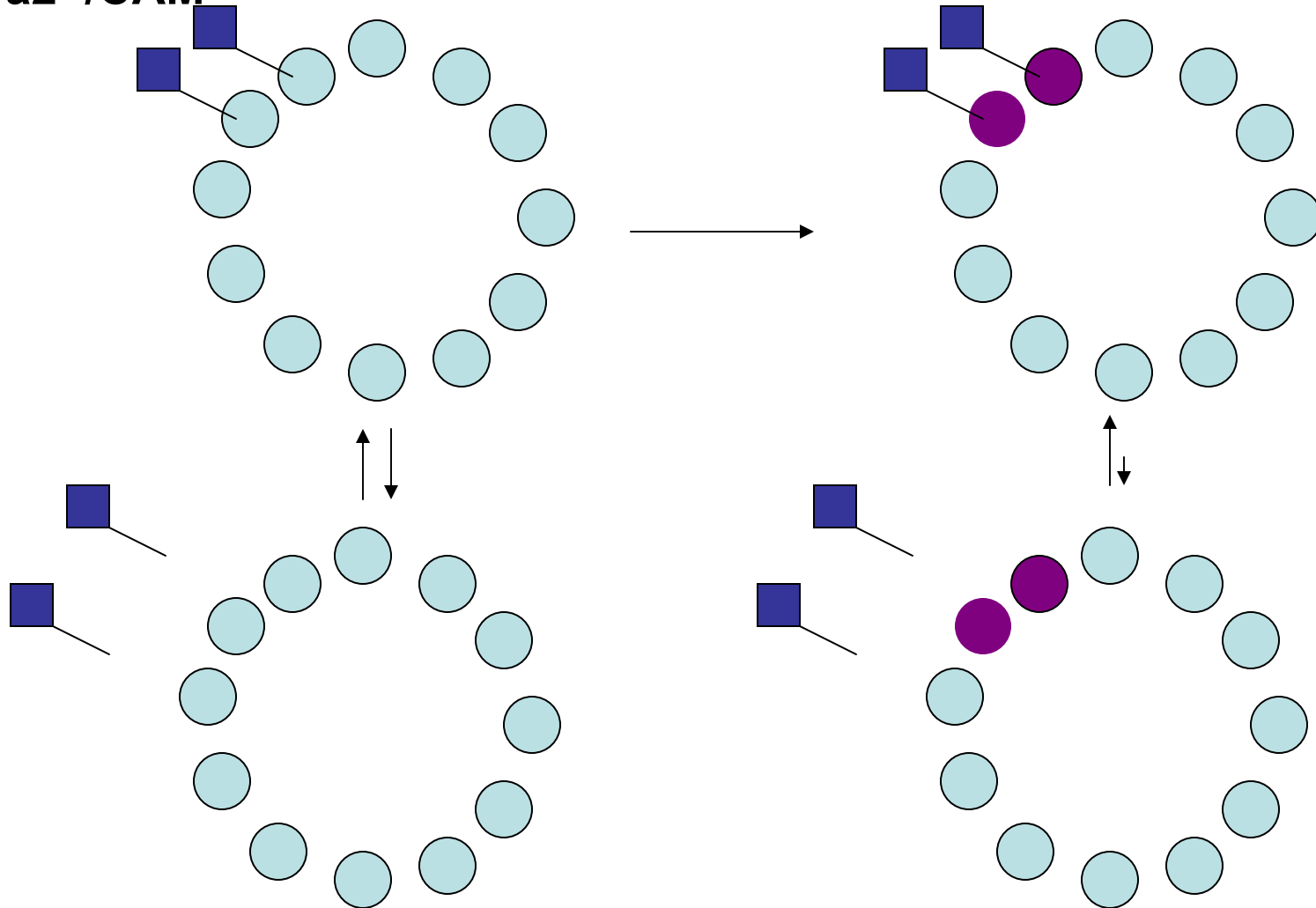


Regulatory Networks in Yeast

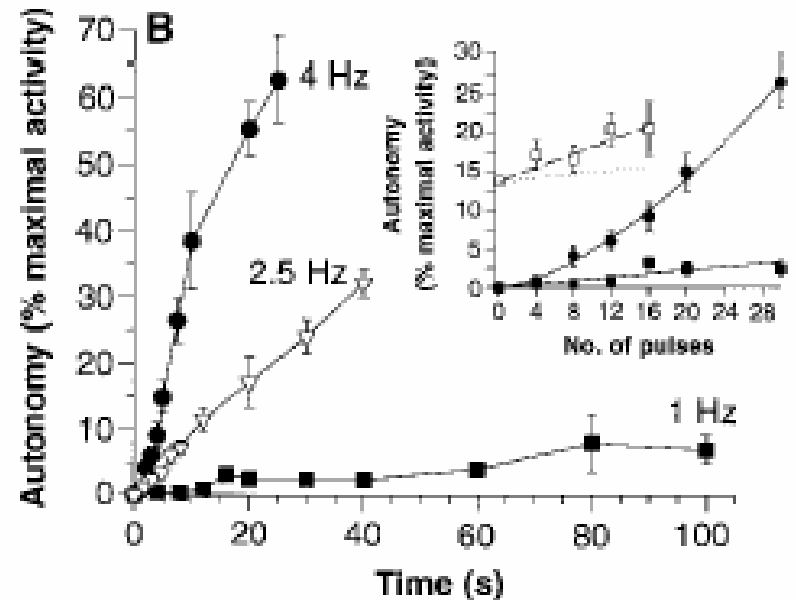
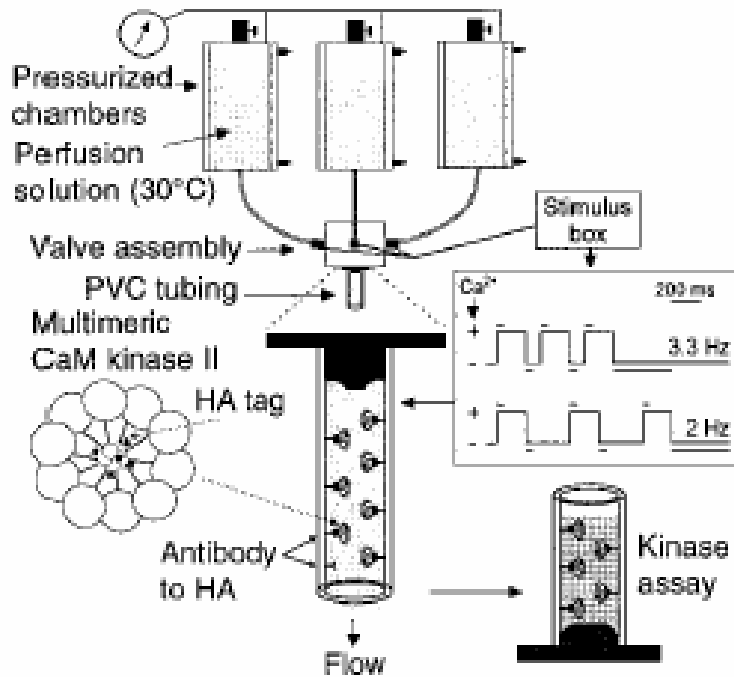


Autophosphorylation of CAM Kinase II

Ca²⁺/CAM



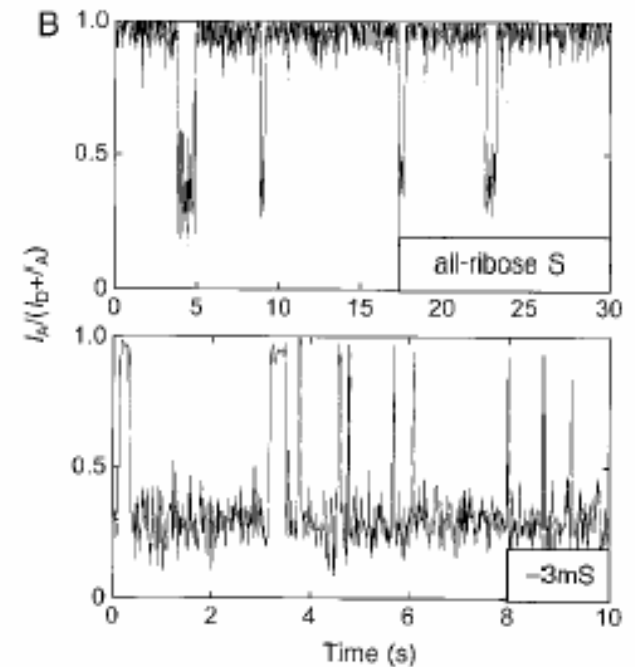
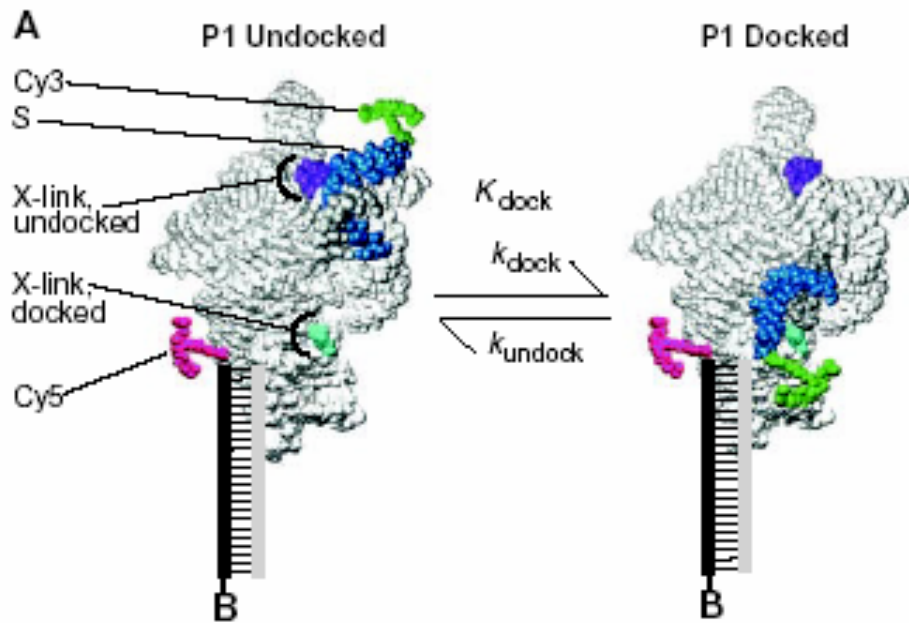
Sensitivity of CAM Kinase II to Frequency of Stimulation



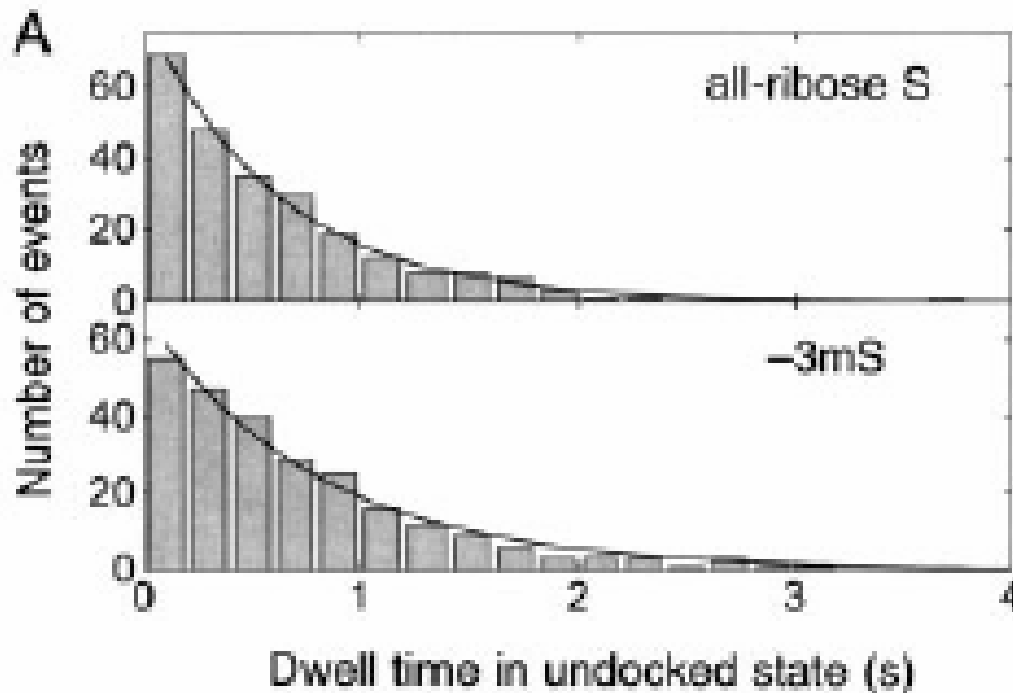
What Might Be the Physiological
Function of an Enzyme that Can
Decode Frequencies?

Stochastic Physiology

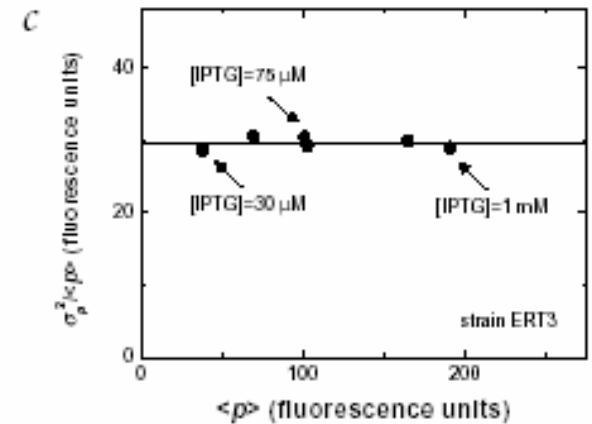
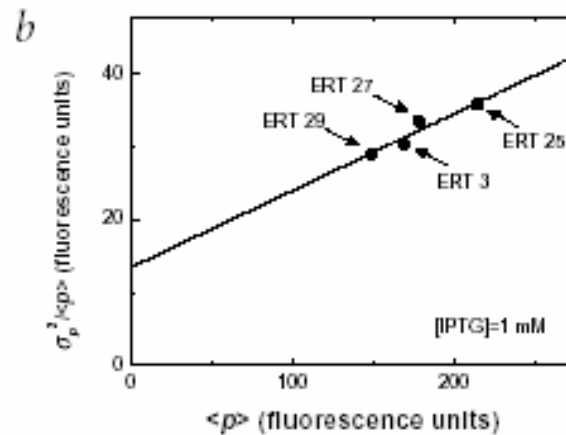
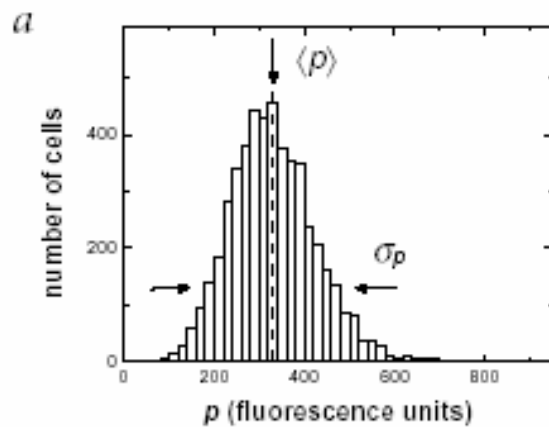
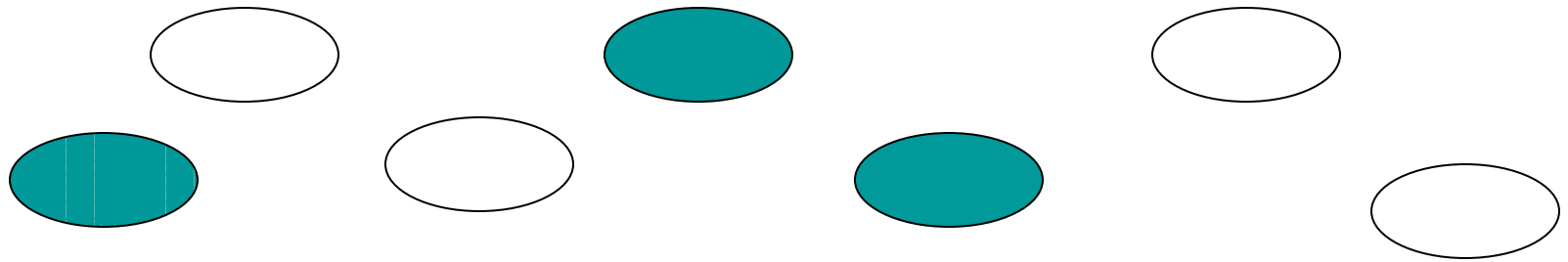
Conformational Dynamics at the Single-Molecule Level



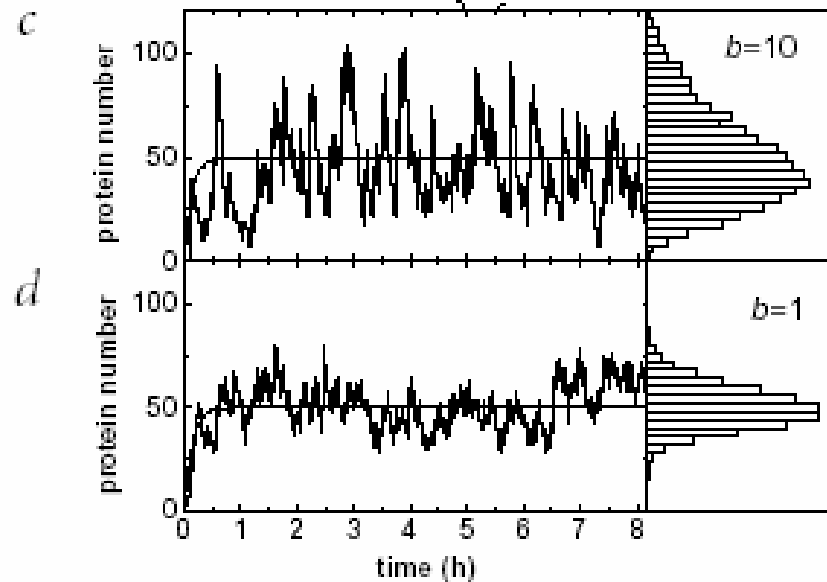
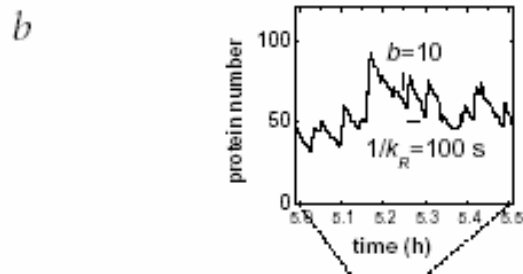
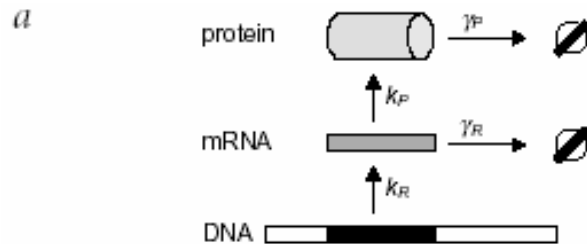
Variance in Single-Molecule Lifetimes is Large



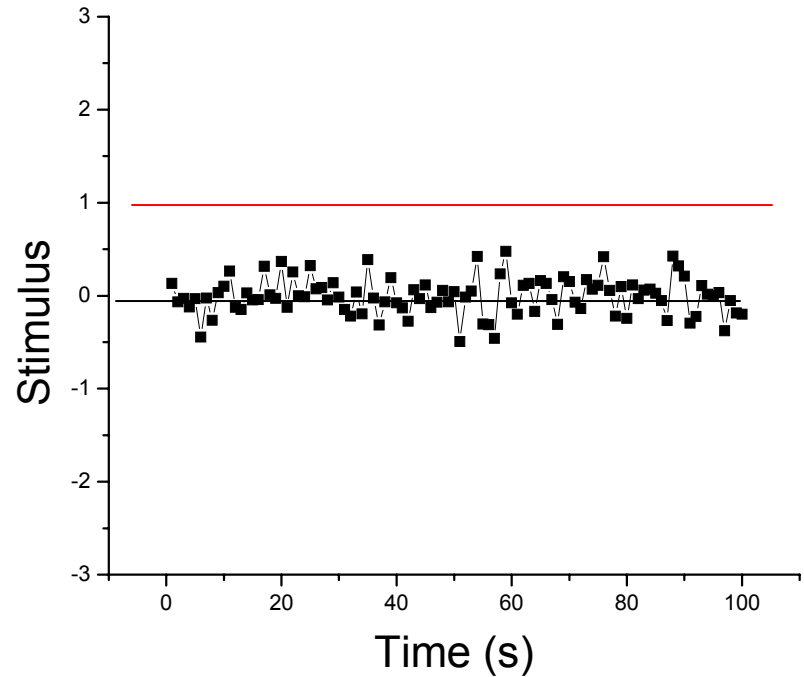
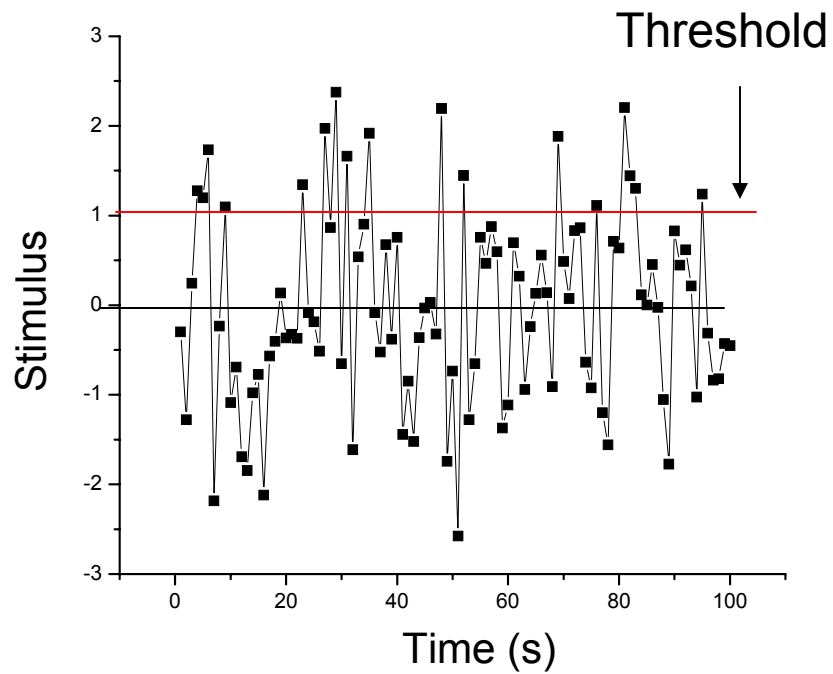
Noise in the Expression of A Single Gene



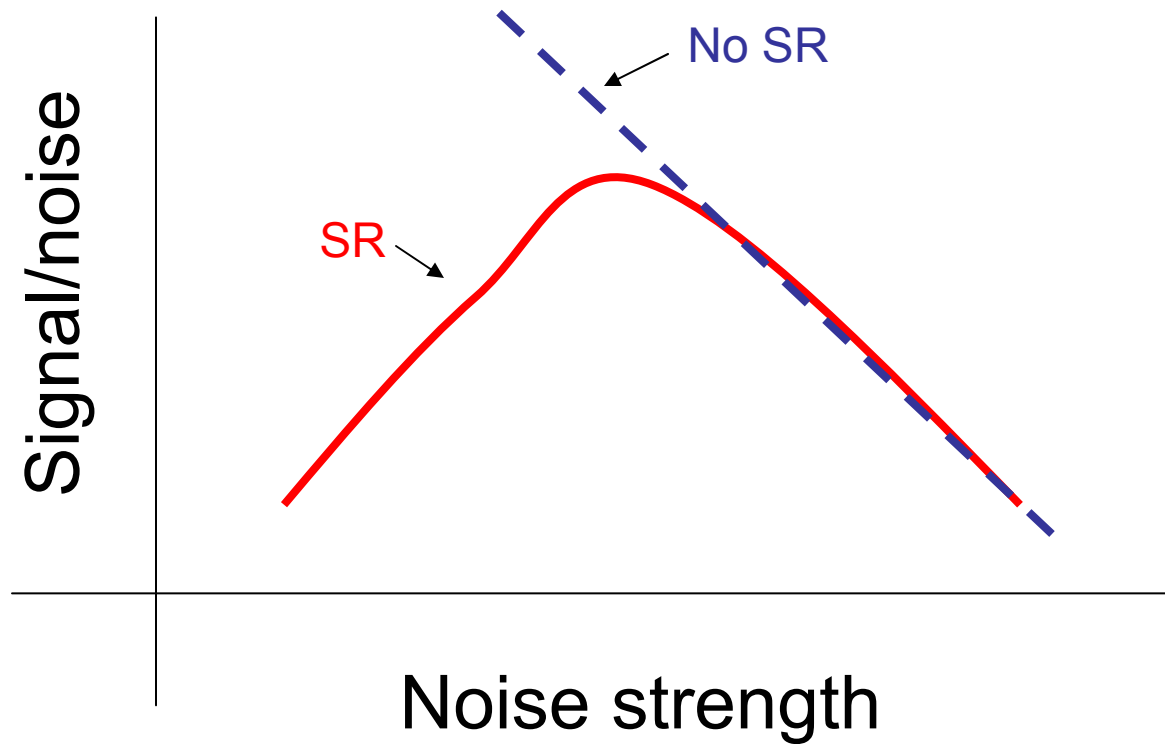
Noise in the Expression of A Single Gene



Stochastic Resonance

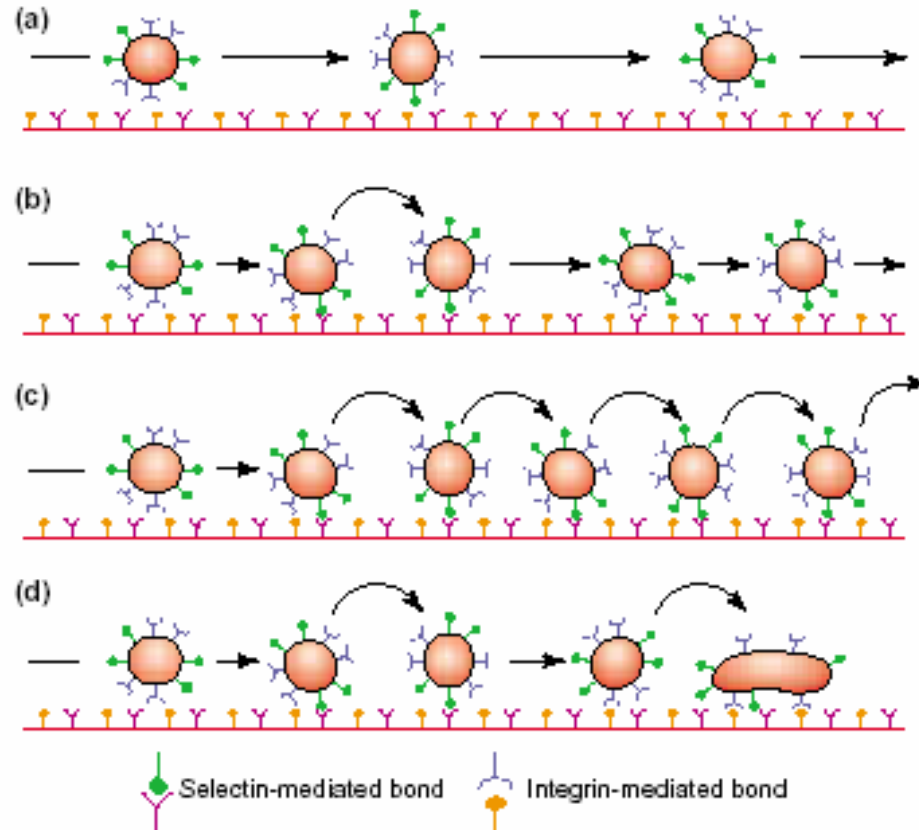


Stochastic Resonance



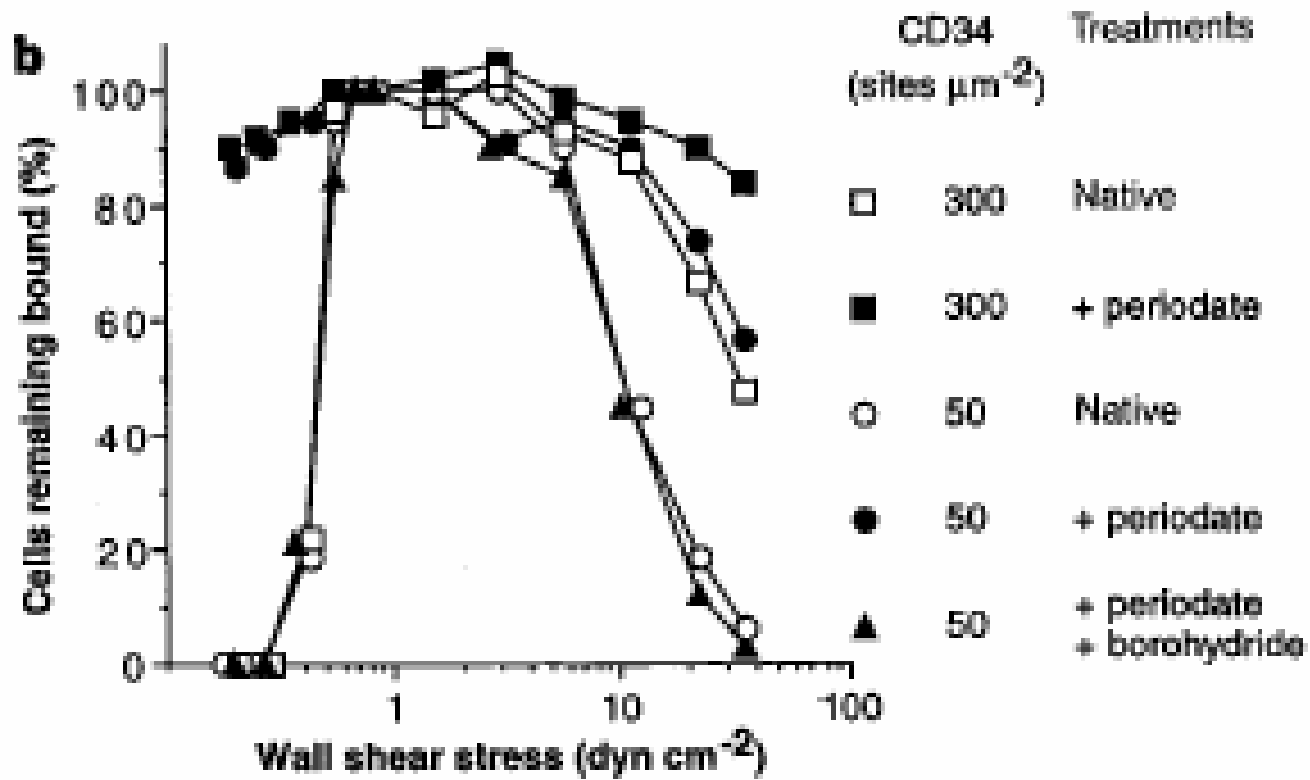
Mechanical Properties of Biomolecules

Leukocyte Rolling

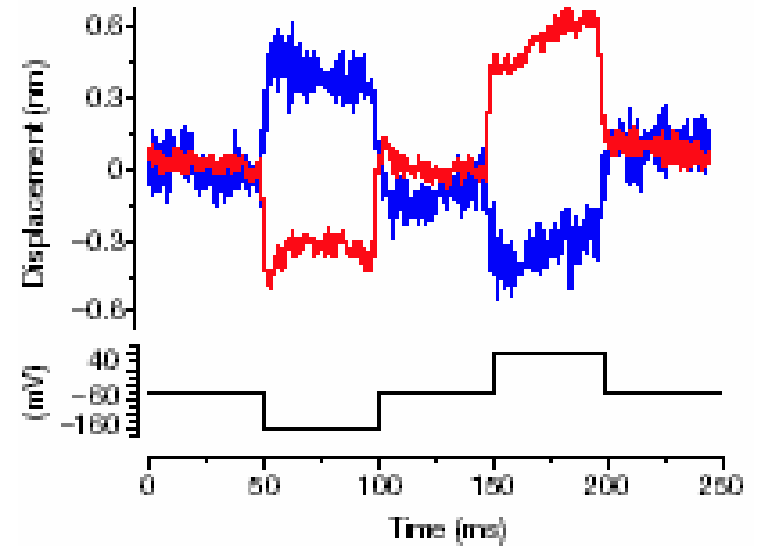
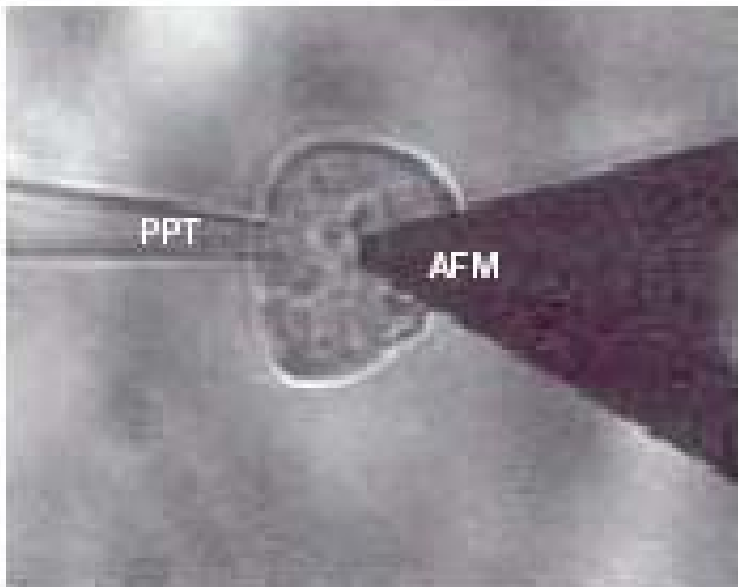


TRENDS in Biotechnology

Shear-Force Dependent Adhesion

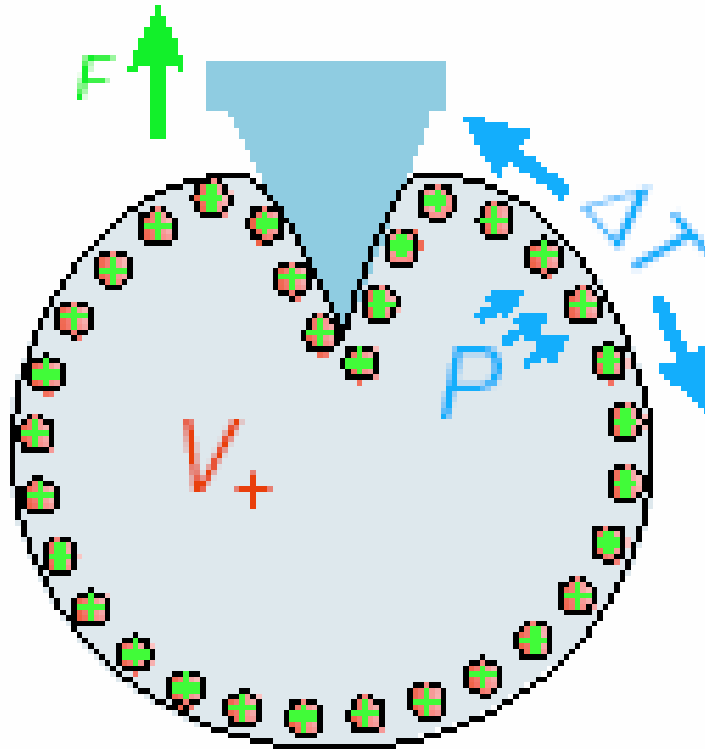


Transmembrane Voltage and Membrane Tension



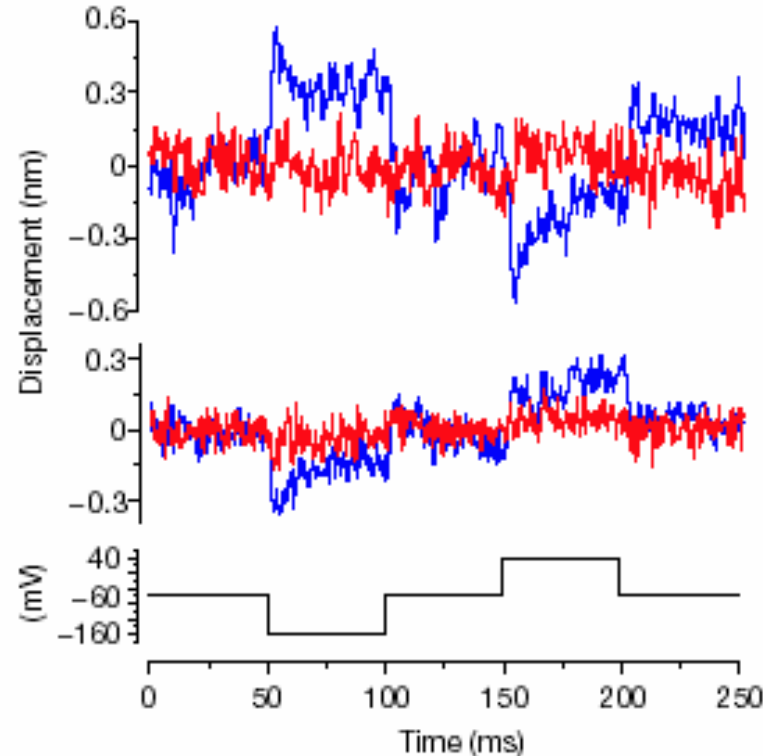
Zhang, P-C., et al., Nature 413 428 (2001)

Transmembrane Voltage and Membrane Tension



Zhang, P-C., et al., Nature 413 428 (2001)

Salicylate Reduces Electromotility



Zhang, P-C., et al., *Nature* **413** 428 (2001)