Single Molecule Methods and Static Heterogeneity

What Happens When Protein Activity Increases?

Patch Clamp Techniques for Recording Single Ion Channels

Patch Clamp Techniques for Recording Single Ion Channels

Membrane patch containing channel

Sakmann, Colquhoun, and Hawkes

Different Open States of the AMPA Receptor

Smith and Howe, Nature Neuroscience 3 992 (2000)

Single-Molecule Fluorescence Microscopy
Confocal Microscopy


Total Internal Reflection Microscopy


Single Molecule Methods and Dynamic Heterogeneity

Probability Density Function

\[ f(t) = \lambda \exp(-\lambda t) \]

Area = probability of lifetime ≤ 2 s
Enzymatic Catalysis on the Single Molecule Level


Rate Constants for Conformational Changes

$C_2L \rightleftharpoons OL$

(Mean closed time)$^{-1} = $opening rate constant

(Mean open time)$^{-1} = $closing rate constant

Enzymatic Catalysis on the Single Molecule Level

Dynamic Disorder

Autocorrelation Function

\[ \langle \nu(0) \nu(\tau) \rangle \]

\[ \langle \nu^2(0) \rangle e^{-\xi \tau/m} \]

"Memory Effects" in Enzymatic Catalysis


Autocorrelation Function of Dwell Times