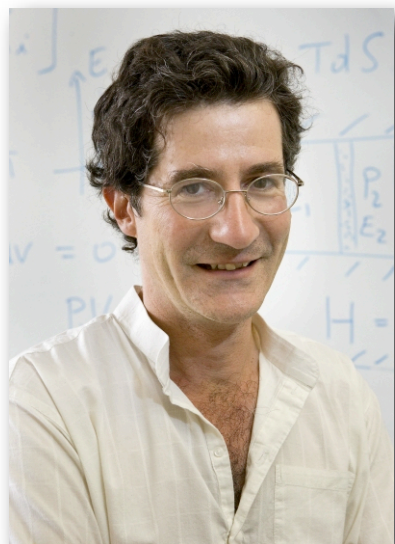


Physical Chemistry Seminar

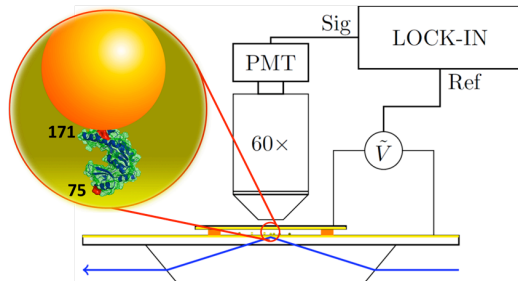


Professor Giovanni Zocchi

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Nano-Rheology of Enzymes

Enzymes couple a chemical process to conformational motion. While end states are often known structurally, a dynamic description of conformational motion is almost entirely lacking. However, it is in the dynamics that some universality may emerge.



We have developed a nano-rheology method where the ensemble averaged deformation of an enzyme subjected to an oscillatory stress is measured with sub-Angstrom resolution – an improvement of a factor 100 over previous mechanical measurements.

Measurements on the enzyme Guanylate Kinase reveal a viscoelastic transition in the dynamics. We propose that ligand induced conformational changes generally operate in this viscoelastic regime, and view conformational motion as the process of crossing a phase line separating linear elastic from dissipative (viscoelastic) behavior in a non-equilibrium phase diagram in the stress – frequency plane.

In short: the molecules we are made of “flow” from one solid – like conformation to another.

These measurements, in conjunction with conceptually similar but methodologically different nano – rheology experiments on the opening and closing of a voltage gated ion channel, suggest a somewhat universal value $\gamma \approx 0.1$ g/s for the dissipation coefficient which characterizes the conformational flow.

Monday, January 6, 2014

4:00 P.M.

2033 Young Hall