Physical Chemistry Seminar

Tuesday, September 25, 2018 | **11:00 am** | **Room 1315 Chemistry Building**

"Multiscale kinetic modeling of Cl-/H+ antiporter: Integrating simulation and experiment to characterize ion exchange"

Professor Jessica Swanson

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Host: Prof. Arun Yethiraj

One of the central challenges in modern biophysics is understanding the molecular nature of coupled biomolecular transport mechanisms. The coupled ion exchange mechanism in Cl^-/H^+ antiporters offers an intriguing case study for this challenge. In this talk I will present our new approach to multiscale kinetic modeling (MKM) and its application to characterize Cl^-/H^+ exchange. We combine rate coefficients, calculated with reactive and polarizable molecular dynamics simulations, in a kinetic (Markov state) model, and then optimize the rate coefficients within their calculated error to reproduce experimental data. This produces a set of solutions that predict new, testable properties and reveals insight into the series of transitions that define the mechanism, the molecular origin of the 2.2:1 Cl–/H+ stoichiometry, and the influence of protein orientation. I'll explain how the consistent exchange ratio is a consequence of kinetic coupling and how the lack of a large conformational change suggests a more facile evolutionary connection between chloride antiporters and channels. Finally, I'll discuss how an ensemble of different exchange pathways, as opposed to a single series of transitions, culminates in the macroscopic observables and thereby explains the molecular mechanism.

For information regarding her research, visit web.ci.uchicago.edu/people/profile.php?id=945

Refreshments will be available prior to seminar at 10:45 a.m. in the Shain Atrium

Graduate Students can meet with the speaker in Room 8305F at 1:00 pm