

Abstract for an Invited Paper
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On the Evolution of Voltage Gated Ion Channels

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This talk summarizes some ideas, calculations and data analysis/collection surrounding the structure and evolution of ion channels, in particular voltage gated sodium channels. The great advantage of ion channels is that they are individual proteins whose function has long been known and is readily inferred through voltage measurements. Their evolution can be tracked through the growing data base of sequences. Kinetic data is readily available, showing important differences between nearly identical channels. I will discuss our efforts to collate available functional data on voltage gated sodium channels into an 'ion channel property space' . We then use this dataset to infer underlying kinetic models, and to create evolutionary trees based on the function of the channels. Finally, I will discuss our endeavors to how ion channels evolved to be the way they are: Examples of questions we would like to answer include: to what extent do design principles dictate the details of the kinetic schemes of ion channels, such as (a) the symmetry of the sodium and potassium channels (or lack thereof), as reflected in their kinetic schemes ; (b) the coupling of sodium channel kinetics to potassium channel kinetics; or (c) activation/inactivation of the channels themselves.