Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Ion channel model development and validation PETER HUGO NELSON, Benedictine University — The structure of the KcsA ion channel selectivity filter is used to develop three simple models of ion channel permeation. The quantitative predictions of the knock-on model are tested by comparison with experimental data from single-channel recordings of the KcsA channel. By comparison with experiment, students discover that the knock-on model can't explain saturation of ion channel current as the concentrations of the bathing solutions are increased. By inverting the energy diagram, students derive the association-dissociation model of ion channel permeation. This model predicts non-linear Michaelis-Menten saturating behavior that requires students to perform non-linear least-squares fits to the experimental data. This is done using Excel's solver feature. Students discover that this simple model does an excellent job of explaining the qualitative features of ion channel permeation but cannot account for changes in voltage sensitivity. The model is then extended to include an electrical dissociation distance. This rapid translocation model is then compared with experimental data from a wide variety of ion channels and students discover that this model also has its limitations. Support from NSF DUE 0836833 is gratefully acknowledged.

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Date submitted: 17 Dec 2009 Electronic form version 1.4