Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Examination of mathematical models for voltage attenuation in dendritic trees of geniculate neurons KEEGAN HINES, Washington and Lee University, WILLIAM GUIDO, Virginia Commonwealth University — An examination of Rall's model of Electrotonic Compactness in neuronal dentritic trees was conducted. The principal power of this model is a prediction for dendritic morphology as it is related to voltage attenuation and efficient transmission of electrical signals. In particular, this study tested the validity of Rall's "3/2 power rule" with precision and accuracy not previously sought. Cells were imaged using fluorescent tagging and multi-photon confocal microscopy in order to render three dimensional images of cells *in vivo*. Dendritic diameters and lengths were measured on either side of junction points and these values were compared to Rall's prediction. Cells of varying ages were measured in order to simultaneously investigate whether deviations from Rall's model increased or decreased with brain development. Cells of age P8 tend to adhere closely to Rall's predictions while mature cells (∼P30) show morphologies which would lead to inefficient signal flow. These data coincide well with previous studies which indicate that as cells grow, membranes mature and acquire ion channels which lead to non-linear conductances across the membrane. This is a possible explanation for why, from a purely morphological standpoint, cells grow into a less electrically efficient formation.

Keegan Hines
Washington and Lee University

Date submitted: 10 Nov 2008 Electronic form version 1.4