Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

A Mathematical Analysis of of Second Messenger Compartmentalization in Neurons[1] WEN CHEN, HERBERT LEVINE, WOUTER-JAN RAPPEL, CTBP, UCSD — Recent experiments in hippocampal neurons have demonstrated the existence of compartments with elevated levels of second messenger molecules. This compartmentalization is believed to be necessary to ensure signaling specificity. Here we use analytical and numerical techniques to investigate the diffusion of a second messenger in the soma and the dendrite of a neuron. We obtain analytical solutions for the diffusion field and examine the limit in which the width of the dendrite is much smaller than the radius of the soma. We find that both the degradation rate and the width of the dendrite play a critical role in determining the concentration within the two compartments.

[1]This work was supported by the Center for Theoretical Biological Physics (NSF PHY-0822283).

Wen Chen
CTBP, UCSD

Date submitted: 17 Nov 2009 Electronic form version 1.4