Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

How cells decide between life and death: predictions from stochastic simulation SUBHADIP RAYCHAUDHURI, ERIC WILLGOHS, THUC-NGHI NGUYEN, University of California Davis — Recent experiments show that cells experiencing oxidative stress conditions trigger both apoptotic (programmed cell death) and survival pathways. Cross-talk between those two complex signal transduction networks, in turn, crucially decides between life and death of a cell. We have developed a Monte Carlo stochastic simulation method that can predict the outcomes of cellular decision-making (between life and death) under oxidative stress in a probabilistic manner. Even under identical cellular conditions our stochastic simulations can lead to differential cellular response as observed in recent in vitro experiments. Interestingly, our numerical experiments indicate that spatial heterogeneity and localization of signaling molecules, in addition to the structure of the signaling networks, are crucial to such a stochastic outcome of cell signaling. By performing sensitivity analyses under a variety of physiological conditions we are able to identify some of the critical regulators of apoptotic cell death signaling under oxidative stress.

Subhadip Raychaudhuri
University of California Davis

Date submitted: 20 Nov 2006 Electronic form version 1.4