1077-37-2010 **Danilo Diedrichs*** (danilo-diedrichs@uiowa.edu), 2890 Coral Ct., #302, Coralville, IA 52241.
A Mathematical Model of the Unfolded Protein Response to Stress in the Endoplasmic Reticulum of Mammalian Cells.

The unfolded protein response (UPR) is a cellular mechanism whose primary functions are to sense perturbations in the protein-folding capacity of the endoplasmic reticulum and to take corrective steps to restore homeostasis. Recent experimental results on mammalian cells show that the UPR is capable of producing qualitatively different outputs depending on the nature, strength, and persistence of the inducing stress. This study proposes a mechanistic framework (ODE model) based on biochemical rate equations to model the dynamics of the UPR as a network of interacting proteins and mRNAs. The model, calibrated by experimental data, includes the UPR's intrinsic feedback loops and allows for the integration of various forms of external stress signals. It can be used to predict the behavior and outcome (adaptation or apoptosis) of a cell when it is subjected to different forms of stress. Ramifications of a perturbation in the UPR can also be predicted, which is useful for the design of treatments of UPR-related diseases, such as diabetes and Parkinson's disease. (Received September 21, 2011)