

SPECIFIC BIOMODELING AND ANALYSIS TECHNIQUES
AT CELLULAR AND SYSTEMS LEVEL

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ABSTRACT

Modeling approaches are developed for two different levels, cellular (Part I) and systems (Part II), and used to develop insights into system performance.

PART I consists of three chapters focusing on computational neuroscience models at cellular level. The mechanisms of action of a drug on prefrontal cortical cells are elucidated with two possible hypotheses, and a systematic methodology to study the excitability of cells under inhibitory post synaptic currents (IPSCs) is developed.

PART II focuses on mathematical models at the systems level. Specifically, thermal physiology models of the entire human body are developed using statistical and black box (artificial neural network, ANN) techniques.

The MU 2-D Man, a human thermal model has been developed for designing an automatic thermal comfort control strategy for NASA astronaut space suits and for the US Air Force warfighters in chemo-bio suits. The model has been enhanced using more accurate modeling of digits incorporating arterio-venous anastomoses (AVA) mechanisms that the fingers and toes use for better control of heat transfer.