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Energy Flow in Neuronal Systems ZRINKA GREGURIC FERENCEK, JOHN ROBERT CRESSMAN, ZAID OBAIDA, George Mason University — We will present results from a computational model designed to investigate the physical underpinnings of neuronal systems. Most neuronal models assume that the ionic flow across neuronal membranes is to small to effect the ionic composition inside and outside of cells. However neurons exhibiting high levels of activity can produce ionic redistributions large enough to cause significant changes to cellular excitability. Furthermore, physically-accurate neuronal models must obey conservation of mass and energy. Energy is injected into these cells through the consumption of atp, stored in electrochemical gradients, and dissipated through ionic flow down these gradients. Our model incorporates essential biological mechanisms required to reproduce this energy flow and storage. We will discuss the advantages and limitations of this dynamic system in the context of neuronal function.

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