1046-34-863 **Arthur S Sherman*** (asherman@nih.gov), 12A South Drive, Room 4007, Bethesda, MD 20892-5621. *Oscillations of Calcium, Metabolism, and Insulin Secretion in Pancreatic Beta-cells.*

Glucose is essential for life but is damaging at high levels and blood glucose levels must be maintained within narrow limits. The hormone insulin promotes glucose storage and consumption to blunt the rise after a meal. Defects in this system result in diabetes.

Mathematical interest has focused on modeling insulin secretion by the beta-cells of the pancreas. The first successful model was developed 25 years ago by Chay and Keizer, to explain the bursting electrical oscillations that drive the rises in calcium that are the main trigger for insulin release. The model followed the Hodgkin-Huxley paradigm for electrical activity in neurons and other excitable tissues, such as the heart, but this ubiquitous electrical sub-system is embedded in hormonal and metabolic regulatory networks. The metabolic component further shows evidence of ability to oscillate semi-independently of the electrical component, resulting in a rich repertoire of interactions and outputs. The Dual Oscillator Model combines all of these elements and can account for most of the observed behaviors of beta-cells. The development of this model through multiple iterations between theory and experiment and the challenges for dynamical systems analysis will be discussed. (Received September 12, 2008)