1051-00-1	**Michael C. Reed***, Duke University. *Mathematics, Cell Metabolism, and Public Health.*
There are now 50 years of data giving statistical associations between dietary intakes and various human health problems such as cancer, heart disease, diabetes, and birth defects. Typically the correlations are small and give little information about the causal mechanisms in cells that lead to the pathological conditions. To discover these mechanisms, we need to understand normal cell metabolism and how it changes in disease. This is a daunting task because cell metabolism is an extremely complicated nonlinear dynamical system that is seldom near equilibrium because it is usually adapting to external signals and large changes in inputs (for example, from meals). Furthermore, biological experimentation is difficult because it's hard to measure time courses of concentrations in living cells. However, physiologically based mathematical models are platforms for in silico biological experimentation. Several such models will be described and related to public health issues, including folate supplementation, birth defects, and colon cancer. New mathematical techniques for analyzing the behavior of far-from-equilibrium stochastic dynamical systems and stochastic partial differential equations are needed.. (Received June 05, 2008)