SUNY Potsdam
Chemistry Department

Welcomes Seminar Speaker

Ed Moczydlowski
Department of Biology

"The Importance of Suppressing Excitability: Molecular Physiology of K⁺ Channel Proteins and Chemical Interactions that Determine Thermal Stability of the K⁺ Channel Tetramer"

Electrical signaling in the nervous system is mediated by ion channel proteins that regulate voltage changes across the cell membrane of electrically excitable cells such as nerve and muscle cells. Excitable cells produce transient signals called action potentials that consist of a positive change in membrane voltage (depolarization) due to the opening of Na⁺ or Ca²⁺ channels followed by a negative change in membrane voltage (hyperpolarization) due to the opening of K⁺ channels. The human genome contains a family of voltage-gated cation channel proteins that includes approximately 10 Na⁺ channel genes, 10 Ca²⁺ channel genes, and 78 K⁺ channel genes. In the course of molecular evolution of ion channel proteins, a large number of diverse K⁺ channel genes apparently evolved to serve as negative feedback regulators whose primary function is to suppress excessive excitability. The functional significance of K⁺ channels in neurophysiology can be appreciated by various human genetic diseases of ion channels (channelopathies) associated with conditions of hyperexcitability such as epilepsy and the adverse effects of certain drugs that block a particular human cardiac K⁺ channel leading to arrhythmia.

In recent years, the three-dimensional crystal structures of several K⁺ channel proteins such as KcsA, a Streptomyces K⁺ channel, and Kv1.2, a mammalian voltage-gated K⁺ channel, have been solved. The chemical structures of these proteins provide a unique opportunity to investigate the molecular basis of phenomena such as ionic selectivity and voltage-dependent gating. The seminar will include an overview of what we know about such channel mechanisms and present some recent results on the interactions of inorganic ions and local anesthetic drugs that affect the tetramer stability of KcsA.

Tuesday, November 10th, 2009
4:15 p.m.
Stowell Hall, Room 211
Light refreshments will be served.
All are welcome.