1108-92-279   **Bo Deng*** (`bdeng@math.unl.edu`), Department of Mathematics, University of Nebraska-Lincoln, Lincoln, NE 68588. *Deriving Nernst and GHK Potentials By Ion Pump Dynamics and Electrical Neutrality.* Preliminary report.

Two physiological properties are well known for excitable cell — the existence of electrical resting potential of the cell membrane and the electrical neutrality of the cell outside an immediate vicinity of the membrane. These contrasting facts have not been reconciled in a unified theory. In this talk we will first demonstrate that the long-term effect of an ion pump model is equivalent to the existence of an resting potential (battery) in series with a conductor. We will then show that under the electrical neutrality condition and the Fick's law of diffusion the resting potentials must be given by the Nernst formula for individual ions and by the Goldman-Hodgkin-Katz formula for the membrane. This treatment suggests a mechanistic justification for the conceptual setup for the sodium and potassium channels in the Hodgkin-Huxley model. (Received January 16, 2015)