1152-92-57 **James Sochacki*** (sochacjs@jmu.edu) and **Jeffrey D Kopsick**. *Extending Power Series Methods for the Hodgkin-Huxley Equations, Including Sensitive Dependence.* Preliminary report.

The ordinary differential equations developed by Hodgkin and Huxley to model the electro-dynamics of the neuron have removable singularities in the rate parameters for the sodium and potassium concentration differential equations. Obtaining numerical solutions to these differential equations is difficult because of these removable singularities. Using composition rules for power series and approximating these rate parameters with functions not having singularities are methods that allow one to compute power series solutions around these removable singularities. A numerical analysis of these methods on the ordinary differential equations that includes power series, matlab's ODE45 and the fourth order Runge-Kutta method is given. This study also demonstrates the high sensitivity of these differential equations on parameters and impulses. The methods and ideas developed for ordinary differential equations is extended to partial differential equations for Hodgkin-Huxley networks of neurons in one, two and three dimensions. Numerics showing the similarities and differences of these partial differential equations in these dimensions and to the ordinary differential equations will be presented. (Received August 16, 2019)