1154-68-1850 **William Mark Severa*** (wmsever@sandia.gov), PO Box 5800, MS 1327, Albuquerque, NM 87185. *Neural-Inspired Computation for Efficient Scientific Computing via Random Walks and Surrogate Models.*

The growth in the scale of scientific computing workloads has increased dramatically over the last decade. The Department of Energy's Exascale Computing Project is strong evidence of this, wherein the goal is to accelerate development of exa-op computers to tackle the world's largest computing problems. However, a key limitation in building these large systems is the amount of energy required to run them. In this talk we discuss some of our recent advances towards leveraging low-energy neural computing methods for HPC applications. We contend that these platforms can offer an extraordinary performance-per-Watt advantage, not just in machine learning, but also in aid of scientific workloads. First, we overview a neuromorphic-compatible algorithm for Markov random walks that uses a spiking neural network approach to implement a density-based random walk across a graph. We describe both algorithmic details and hardware results using IBM's TrueNorth. Then, we discuss a class of graph algorithms that can be approached through similar means for high levels of parallelization. Lastly, we briefly describe a growing effort for using deep learning, specifically convolutional neural networks and long short term memory, for fast surrogates of climate (ice sheet) modeling. (Received September 18, 2019)