Learning from disorder and noise in Physical Biology

Friday, May 4, 2018
11:00 AM
BAUD Room 101

Taylor Firman
Graduate Research Assistant
(Research Advisor: Dr. Kingshuk Ghosh)
University of Denver
Department of Physics & Astronomy

Abstract: Stochasticity, disorder, and noise play crucial roles in the functioning of many biological systems over many different length scales. On the molecular scale, most proteins are envisioned as pristinely folded structures, but intrinsically disordered proteins (IDPs) have no such folded state and still serve distinct purposes within the cell. At the scale of gene regulation, realistic in vivo conditions produce stochastic fluctuations in gene expression that can lead to advantageous bet-hedging strategies, but can be difficult to characterize using a deterministic framework. Even at the organismal scale, germband extension (GBE) in Drosophila melanogaster embryos systematically elongates the epithelial tissue using cell intercalation, but leaves cells in highly heterogenous geometries. Throughout this work, we will demonstrate that these characteristics are not just arbitrary artifacts to be glossed over, but are actually very intentional frameworks that are harnessed by the respective systems to their own advantage. In some cases, they can also be harnessed by researchers to better characterize or even control the system through various biophysical techniques. These studies will collectively demonstrate that randomness and fluctuation do not always imply disarray and intractibility, but instead can convey adaptability and possibility. As such, these characteristics should be embraced by the field of biophysics.

HOST: Dr. Kingshuk Ghosh, (303) 871-4866, kingshuk.ghosh@du.edu