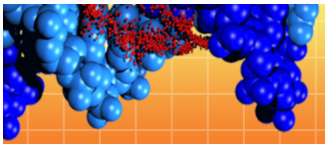

CENTER FOR BIOINFORMATICS & COMPUTATIONAL BIOLOGY

BIOINFORMATICS 2015 SPRING SEMINAR SERIES

Hosted by: Department of Computer and Information Sciences,
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MONDAY, April 6, 2015
3:30pm
DBI Room 102

From flies to humans: Stochastic specification of color-detecting photoreceptors

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ABSTRACT: Development requires the specification of millions of different types of cells from just a single zygote. Amazingly, individuals with the same genome are nearly identical, suggesting that much of development is hard-wired. We know a great deal about how cell fates are robustly and reproducibly instructed by cell-to-cell communication and lineage history. However, recent studies have revealed that cells can also harness 'noise' to drive stochastic cell fate decisions. These stochastic mechanisms are critical to induce gene expression randomly in individual cells to diversify cell fates and distribute them across a tissue. Beyond its role in normal development, stochastic gene regulation can determine whether a person with a mutation will suffer from disease. Despite its importance, very little is understood about how this fundamentally different strategy operates. We study this central question in the context of the stochastic specification of color-detecting photoreceptors in fly and human retinas. In the fly, we have shown that, though the two alleles of a critical regulatory gene make their own individual, random on/off expression decisions, they communicate with one another in order to agree on which decision to make. My lab is studying how DNA looping, nuclear architecture, chromatin state, and natural variation affect stochastic expression decisions and interchromosomal communication. To understand how stochastic expression decisions are made in human tissue, we are growing human retinas from stem cells and examining the distribution of color-detecting cone photoreceptors. The goal of my lab is to determine the fundamental mechanisms controlling stochastic specification and transform our understanding of how the multitude of cell types in our bodies are generated.