



# BIOINFORMATICS SEMINAR

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### GLOBAL REGULATION MEDIATED BY INTRON RETENTION IN IMMUNE SYSTEM

Intron retention (IR) is a major form of alternative splicing. Yet its extent and functional significance in mammalian systems has been underappreciated until recently, when deep sequencing of transcriptome becomes available. In the CD4+ T cell activation process, we observed prevalent IR in resting T cells that is significantly reduced upon activation, as well as pronounced discordance between expression changes and epigenomic changes. These findings led to the identification of a novel post-transcriptional regulatory mechanism whereby transcript stability is modulated by IR. IR globally regulates gene expression in CD4+ T cell activation. We then performed systematic analysis of IR across major immune cell-types. Interestingly, in adaptive immune cells, we found that IR is prevalent in the unstimulated state and significantly reduced upon activation, with the reduction in IR significantly correlated with gene upregulation. In contrast, IR remains unchanged upon activation in innate immune cells. This difference in IR dynamics is highly associated with distinct dynamics in splicing and mRNA degradation. Furthermore, we found that IR is linked with transcriptional read-through, suggesting that, in adaptive immune cells, the control over RNA maturation is lax before activation and is tightened up after activation. In summary, our study suggests a strategic difference in global regulation, as mediated by mRNA biogenesis, between the activation process in adaptive vs innate immune cells.

#### BIOGRAPHY

Dr. Peng applies computational biology, bioinformatics and systems biology approaches to the study of gene regulation. Current areas of interests include integrative analysis of multi-omics data to decipher gene regulatory network in immune system, and development and application of analysis methodologies to characterize novel epigenetic and post-transcriptional regulatory pathways. Dr. Peng received his PhD in Physics from Univ. of Illinois Urbana Champaign, where he researched on theoretical soft condensed-matter physics and phase transition. In his postdoc at UCSD he worked on mathematical modeling of evolutionary dynamics. Dr. Peng is currently a Professor in the Department of Physics and the Department of Anatomy and Cell Biology at the George Washington University.



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