Mammalian Systems biology: FANTOM5 promoters, enhancers and cell type specific regulation

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We are complex multicellular organisms composed of hundreds of different cell types. The specialization of cell types and division of labour allows us to have coordinated complex functions such as responding to pathogens, movement and maintaining homeostasis. In the FANTOM5 project we have been interested in identifying the complete set of transcribed objects in the human genome and then predicting how they work together in the context of transcriptional regulatory networks (TRN). Each primary cell type runs a different version of the TRN based on the set of gene products it expresses. Not only this, but the FANTOM5 CAGE data reveal a wealth of cell-type-specific enhancers that are expressed in a very specific manner. Understanding the cell-type-specificity of these elements and promoters is key to building cell type specific TRNs. Lastly we go beyond the TRNs and examine cell-cell signaling within a multicellular organism. By identifying the sets of protein ligands and receptors expressed in any given human cell type we have made the first draft cell-cell communication network map.