

Spakowitz Research Group

Theory and Computation of Biological Processes and Soft Materials



Epigenetic Regulation

Historically, the central dogma of genetics asserted that DNA sequence holds all of the information that orchestrates cellular function. However, mounting experimental evidence shows the pivotal role that protein and DNA modifications play in the expression of the genome. In other words, two organisms with identical genetic information may have vastly different behavior due to chemical modifications in their genome packaging. This notion of epigenetic regulation represents a paradigm change in how we think about genetic traits. Aberrations in epigenetic markers lead directly to a range of diseases, including various cancers, developmental disorders, obesity, and diabetes. Thus, there is considerable excitement and interest in the game-changing field of epigenetics both from a fundamental perspective and from practical grounds regarding human health. Research in our lab focuses on processes involving DNA to establish a predictive theoretical model that offers new and critical insight into the role of physical forces involved in epigenetic regulation. Towards this goal, we identify key problems that permit us to take progressive steps that are themselves of major importance to the scientific and engineering community.

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