

Dynamics in High Dimensional Models of Genetic Networks

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Gene networks underly the development and functioning of organisms. Activities of genes are controlled by transcriptions factors that in turn result from activities of other genes. A mathematical representation of genetic networks is introduced that allows one to relate the patterns of gene activity to the underlying network structure. Gene networks are represented by differential equations. The dynamics in these equations, and also the network structure are represented schematically using a directed graph on an n-dimensional hypercube. These methods can be used to help design in vitro genetic networks that show oscillation and multistability. They can also be used to determine gene network structure based on the patterns of activation of genes, such as might be determined using gene expression chips.