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Integrating research and teaching in quantitative biology: mathematical modeling of gene regulation.

The 4 College Biomath Consortium (4CBC) consists of faculty and students from Amherst, Hampshire, Mount Holyoke and Smith Colleges. Through the 4CBC, a course titled “Frontiers in Biomath” is offered each year to give students the opportunity to explore biological questions using tools from the life sciences together with modeling and analytical tools from the mathematical, computational and statistical sciences. We developed a module for this course that focuses on modeling gene regulation in *Drosophila*.

In the *Drosophila* fruit fly, the identity of cells in the developing embryo falls under the control of a complex network of genes. The expression of each of these genes is in turn controlled by interactions between protein transcription factors (TFs) and cis-regulatory modules (CRMs) in the neighboring intergenic DNA regions. A major goal of current research is to understand how the sequence architecture of TF binding sites mediates the functional activity of these CRMs using integrated computational and molecular genetic experimental approaches. In this interdisciplinary module we explore some of the research tools that are available to study protein-DNA interactions and investigate mathematical models of their functional activity. (Received September 22, 2015)