

# Evolution of Pattern Forming Protein-Gene Networks

Adam Thomas | Advisor: Herbert Sauro  
Keck Graduate Institute, REU Program 2005



Patterns occur frequently in nature. One such pattern of interest to researchers has been the gene-protein network which causes the segmentation of the abdomen of *Drosophila*. This gene-protein network is of particular interest because it creates a robust, stable pattern of protein concentrations from cells containing identical networks. In my project I evolved a series of gene-protein networks which produce stable patterns when simulated in a one-dimensional ring of cells containing identical networks. Networks for several different periodic patterns were evolved. Network structures were compared to investigate possible similarities and a modular structure which could be generalized for all pattern forming networks. Preliminary evidence suggests that a gene-protein switch is a necessary part of the network and the initial concentrations of proteins in each cell play an important role in how stable the pattern will be.

