Computational Modeling of Maternal Morphogen Gradients in the *Drosophila* Embryo

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Poster (2:20 PM)

During early embryogenesis, four maternal genes distribute themselves in distinct gradients along the A-P and D-V axes. Combinatorial action of these maternal genes leads to the development of the embryo including the specification of the axes which is of particular interest here. Close to the center of the embryo, across the A-P axis, only one of the maternal genes – Dorsal is present. Hence, it is reasonable to expect that specification of the DV axis and downstream activation of genes is regulated by Dorsal. To be able to gain further insights into embryogenesis and spatial activation of genes along the DV axis, the work attempts to characterize the Dorsal gradient [1, 3] along DV axis.

Based on the models proposed for NF-κB molecules [2] in mammalian cells, a reaction diffusion model has been proposed regulating the nuclearization of Dorsal. The model has been applied on a novel transport system which has not been used previously for computational analysis of the syncytium. This novel transport model is a better approximation to the real case as it considers the existence of a nuclear island around each nucleus from cycle 10 to cycle 14. The parameters of the model have then been estimated using Genetic Algorithms.

[1] DeLotto, R., DeLotto, Y., Steward, R. and Lippincott-Schwartz, J. *Development* 134, 4233 (2007).
[2] Lipniacki, T., Paszek, P., Brasier, A., Luxon, B., and Kimmel, M. *Journal of Theoretical Biology* 228, 195 (2004).
[3] Moussian, B., & Roth, S. *Current Biology* 15, R887 (2005).