

**Meeting:** 1003, Atlanta, Georgia, SS 29A, AMS Special Session on Mathematical Sciences Contributions to the Biomedical Sciences, I

1003-92-1256      **Alla Borisyuk\*** ([borisyuk@mbi.osu.edu](mailto:borisyuk@mbi.osu.edu)), Mathematical Biosciences Institute, Ohio State University, 231 W. 18th Ave, Columbus, OH 43210, and **Brian H Smith** ([smith.210@osu.edu](mailto:smith.210@osu.edu)), Dept of Entomology, Ohio State University, 318 W. 12th Ave, Columbus, OH 43210.

*Representations of odor mixtures and learning in insect olfactory system.*

Integration across multiple levels of analysis - genetic, molecular, electrophysiological, behavioral - is becoming possible in many biological systems. An example of this is the study of learning in insect (and mammal) olfactory system. A prominent conjecture in the field is that the behavioral phenomena must in some way be based on the representations of odors and on learning-induced changes to these representations in the antennal lobe of the insect brain. But before one can do electrophysiological experiments to test this, it is necessary to investigate what types of odor-related activity patterns and what changes to them would support the conjecture. We use mathematical modeling to address this question.

Our models of insect antennal lobe are in the form of either a discrete network or an integro-differential equation with short-range inhibition. We use these models to study the spatio-rate representations of single odors and binary odor mixtures in the antennal lobe, and to study how these representations are modified by learning. The modeling results suggest what could be the neuronal substrate for various behavioral phenomena. (Received October 05, 2004)