

Xiaoying graduated in 2009 from Sun Yat-Sen University, Guangzhou, China, with a B.S. in Biological Sciences. She had a board interest in Life Science disciplines and great passion to explore diverse and novel areas. As an undergraduate, Xiaoving had successful experiences in ecology, neurosciences, animal behaviors, signaling network and stem cell research. In 2009, Xiaoying started to pursue her advanced degree in Purdue and joined Dr. Umulis' group to work on computational modeling of complex developmental network in Drosophila.





Thesis Defense

Speaker:	Xiaoying Yang
Title:	Evaluation of Bioimage Normalization Strategies to Quantify Morphogen Gradient
Major Professor(s):	Dr. David Umulis
Date:	Wednesday, November 30, 2011
Time:	9:00 am
Location:	ABE 301

Abs tract:

Morphogenic molecules play critical roles in directing pattern formation in organisms. Their threshold-dependent regulatory functions entail the need to study their concentration profiles. The numerical profiles usually need to be converted from experimental data such as images and to common scale for proper comparison. Three normalization methods, Minimum Variance, Extrema Pinning, and Fixed Integral, are commonly used in the conversion processes and their efficacies have never been evaluated. In this study, we effectively compare the three methods using computationally simulated data. We constructed a mathematical model to simulate the production, diffusion, and decay behavior of a morphogen to generate 'ground truth' data that contains the true quantitative information of the molecule that cannot be easily acquired experimentally. We then added artificial noise to represent the various errors produced in experiments and processed the noisy data as we would with real experimental data. Statistical analysis, including significance testing and sample size estimation, were performed on data before and after normalization. We found that Minimum Variance is the most efficient method in capturing true data profiles and detecting incremental differences. Extrema Pinning and Fixed Integral, however, exhibit weakness in data distortion and high demand for samples, respectively. Our results indicate that extra care must be taken in experiments in choosing the most efficient method for data comparison.