COLLEGE OF
Engineering, Computer Science, and Technology

Seminar in Interdisciplinary STEM Research

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Location: ASCB 132

HOSTED BY CREST-CATSUS AND SIKAND SITI CENTERS

Ben Vincent, PhD

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Ben Vincent received his B.A. in Biology and Neuroscience from Amherst College, and his Ph.D. in Genetics and Genomics from Harvard University, where he was mentored by Angela DePace. Prior to starting his research lab at Cal State LA, he performed postdoctoral research with Mark Rebeiz at the University of Pittsburgh, where he was supported by a National Research Service Award from the National Institute of General Medical Sciences. His current research focuses on the genetic and cellular differences between rapidly evolving structures in fruit flies.

Abstract: Identifying the genetic changes that cause morphological differences between species is a major goal of evolutionary and developmental biology. While many groups have found success by investigating differences in pigmentation or the regressive loss of entire structures, we know less about the genes and pathways involved in the diversification of three-dimensional body parts. The posterior lobe in the *Drosophila melanogaster* clade is an ideal system to investigate how body parts evolve. This genital structure exhibits staggering diversity among the *Drosophila melanogaster* subgroup, including the sister species *Drosophila mauritiana* and *Drosophila simulans.* We can also track posterior lobe development by dissecting and staining pupal terminalia in mutliple species. Previous work has shown that the posterior lobe develops in *Drosophila melanogaster* as a result of cell elongation, and posterior lobe morphology is controlled in part by the apical extracellular matrix (aECM) component Dumpy. We therefore tested whether the aECM also underlies posterior lobe diversification between *Drosophila simulans* and *Drosophila mauritiana*. Using immunohistochemistry and confocal imaging, we quantified differences in posterior lobe morphology between these species and determined when these differences arise during pupal development. By labeling the aECM with fluorescent lectins, we found that it associates with the presumptive posterior lobe and during early development, and these attachments are more extensive in *Drosophila simulans*, the species with the larger lobe. The aECM also associates with a neighboring genital structure, the clasper, that also exhibits morphological differences between species. Using hybridization chain reaction to measure the *dumpy* gene expression pattern at cellular resolution, we found that this pattern is expanded in posterior lobe cells in *Drosophila simulans* compared to *Drosophila mauritiana*. These results suggest that morphological differences between species are at least partially controlled at the level of transcriptional regulation. Finally, we measured the gene expression patterns for other aECM components using *in situ* hybridization in both species. We find that some of these genes serve as markers for particular genital structures, and others may exhibit regulatory divergence between species. Our results suggest that alterations in extracellular matrix organization may underlie morphological differences between species, and that heterogeneity within the matrix may have functional consequences for genital development and evolution.

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