



# **GRADUATE SCHOOL OF BIOMEDICAL SCIENCES**

## **INTERDISCIPLINARY GRADUATE PROGRAM**

### **Ph.D. THESIS DEFENSE**

**IO LONG CHAN**

MENTOR: Oliver Rando, PhD  
Monday, September 23, 2019 11:00 a.m.  
LRB-816

### The plasticity and variation in gene expression during development in *C. elegans*

Organisms modulate their response to changing environmental conditions through changes in gene expression, and extensive variations in gene expression is prevalent among individuals even within a population. This widespread plasticity and variability of gene expression is thought to play roles in adaptation and drive novel phenotypes in species. Understanding the mechanisms that contribute to such variations require the analysis of interactions between the genome and its environment and sequence variations within the genome. This work consists of two projects investigating the plasticity and variation of gene expression during post-embryonic development in the nematode *C. elegans*.

In the first study, I examined the response to changes in population density in developmentally arrested L1 larvae. I systematically characterized arrested L1 larvae from low to high densities using single-worm RNA-seq and uncovered that the density of resuspended L1 larvae regulates the expression of hundreds of mRNAs. Further analysis revealed that the physiological response to changes in density is rapid and signaled by a non-canonical *daf-22* ascaroside independent pathway. In the second study, I investigated the evolution of gene expression within species using two genetically divergent *C. elegans* strains (N2 and CB4856). I carried out RNA-seq and allele-specific analysis across six different conditions and four developmental stages, and we examined gene expression divergence using the homozygous parent and F1 hybrid system. This work provides a new experimental model for studying the evolution of gene expression and a comprehensive view of gene expression variation during development in *C. elegans*.

#### **Mentor(s)**

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