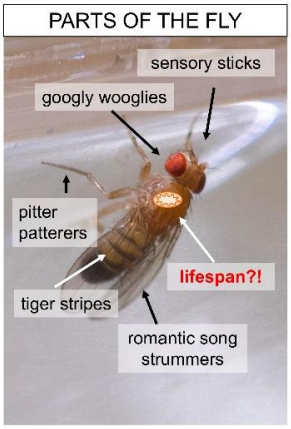
A/Professor Damian Dowling - The Experimental Evolutionary Biology Research Group

Project Title	*Does mitochondrial evolution "curse" males to shorter lifespans?*		
Supervisors	A/Professor Damian Dowling	damian.dowling@monash.edu	+61 3 9902 0479
Other Supervisors	Dr Rebecca Adrian	rebecca.adrian@monash.edu	
Location	Clayton Campus, 18 Innovation Walk		
Outline of Project			

Background: We have recently discovered that mitochondrial genomes act sexually antagonistically—some haplotypes work well in females, but are relative duds in males. Evolutionary theory can explain this phenomenon, which has become known as "Mother's Curse" (as mitochondria are maternally inherited). Evidence to date suggests that Mother's Curse may explain a widespread pattern across the life-histories of animals: that females tend to outlive males. We have developed a new set of genetic strains of fruit flies that will enable us to answer this question by exploring the mitochondrial and nuclear genetic contributions to lifespan and other physiological traits in both sexes. New equipment opens up an exciting new opportunity to test lifespan in large sample sizes with minimal time investment (a high-throughput longevity assay).



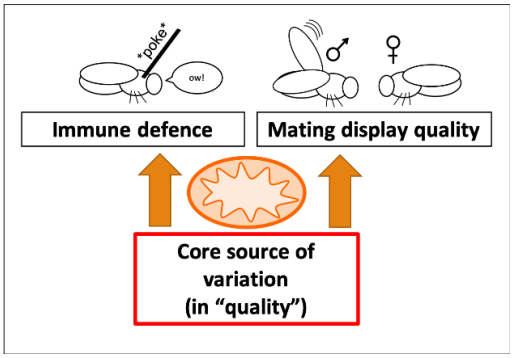
Project Aims: This project will 1) elucidate the role that the mitochondrial and mitochondrial-nuclear genotypes play in determining lifespan and to 2) examine whether genotypes that benefit females are harmful to males. Exploring these questions in the model system of the fruit fly is a critical step toward understanding the means through which our tiny mitochondrial genomes have big effects on our lives.

Techniques: This project will utilise lab-based techniques to quantify lifespan and to maintain and phenotype laboratory populations of fruit flies. This involves working extensively with stereomicroscopes, collecting, sexing, and crossing fly populations, and using equipment developed for behavioural and physiological phenotyping. The project requires a good working understanding of key concepts in evolutionary ecology and in the analysis of data using statistical approaches such as linear modelling. Accordingly, it is well suited to a student who has completed BIO3011, and at least one of BIO2022, BIO3070, BIO3052 or GEN3062.

Project Title	*From cell to system: mitochondria as mediators of physiological quality*		
Supervisors	A/Professor Damian Dowling	damian.dowling@monash.edu	+61 3 9902 0479
Other Supervisors	Dr Rebecca Adrian	rebecca.adrian@monash.edu	
Location	Clayton Campus, 18 Innovation Walk		
Outline of Project			

Background: Recent hypotheses have proposed that variation in mitochondrial performance underlies much of the variation in physiological performance we observe in animals. Such variation has important implications for our understanding of differences between individuals we observe in nature: within any population, some individuals generally seem healthier, stronger, and more attractive to mates (higher "quality"). Complementing a current project that is exploring mating displays in our flies, this honours project will use a targeted subset of our new mito-nuclear genetic lines to explore one of the key physiological processes predicted to be mediated by mitochondrial function: immune response. Fruit flies have a wound-healing response that is easily quantified visually, enabling a relatively simple test of how mitochondrial variation affects individual quality.

Project Aims: This project will test how mitochondrial genetic variation may drive variation in innate immune defense in Drosophila fruit flies. The results of this study will be a key step toward testing the hypothesis that variation in mitochondrial quality underlies variation in individual quality.



Techniques: This project will utilise lab-based techniques to quantify immune response and to maintain and phenotype laboratory populations of fruit flies. This involves working extensively with stereomicroscopes, collecting, sexing, and crossing fly populations, and using equipment developed for behavioural and physiological phenotyping. The project requires a good working understanding of key concepts in evolutionary ecology and in the analysis of data using statistical approaches such as linear modelling. Accordingly, it is well suited to a student who has completed BIO3011, and at least one of BIO2022, BIO3070, BIO3052 or GEN3062.