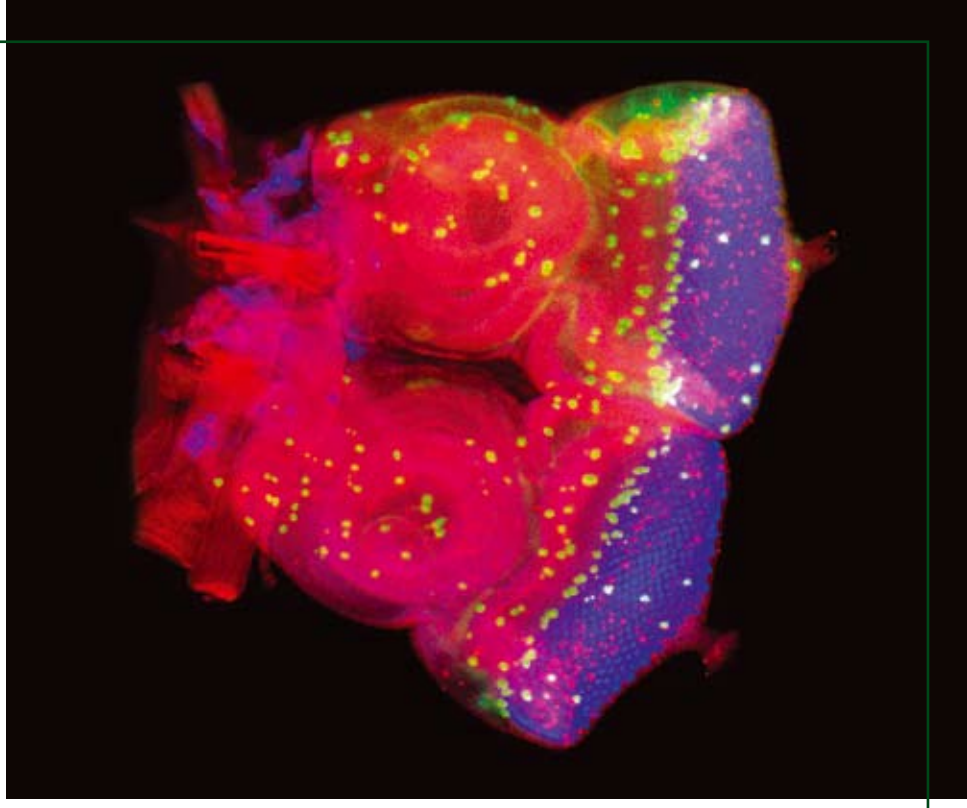
The Molecular Genetics and Evolution Group studies the function and evolution of genes and genomes. We have a particular interest in genes that regulate cell behaviour during the development of animals and how such developmental regulatory mechanisms have evolved. We employ a variety of technologies, including genetics, molecular biology, cytology and cell biology to link genes to biological function and evolution.

We study model organisms such as the vinegar fly, *Drosophila melanogaster,* mouse and yeast to advance our understanding of cell structure and function, development and the genetic basis of evolution. We then use knowledge gained from these studies to advance our understanding of organisms as diverse as coral and humans.



The developing eye-antennal regions of this *Drosophila* (vinegar fly) show a gradient of differentiation as they develop into adult structures. Dividing cells (green) give rise to adult neurons (blue) and excess cells undergo programmed cell death (apoptosis, red) as development progresses. Photo: Ryan Herbert.

MOLECULAR GENETICS & EVOLUTION

Group Leader: Prof. Robert Saint

HIGHLIGHTS

- We continue to build a body of work on the genome of the coral, *Acropora millepora*. In the process, we have generated resources that are being applied to a variety of aspects of coral biology. For example, cDNA libraries were made and thousands of ESTs (expressed sequence tags) collected from bleached adult coral for comparison with healthy coral in an effort to understand genetic changes associated with the reef-threatening phenomenon of coral bleaching.

- A major paper was published further documenting the surprising genomic complexity of corals and their relatives, reporting that corals and humans share some genes previously thought to be vertebrate inventions and emphasizing the importance of gene loss in genome evolution (Technau et al., *Trends in Genetics* **21**: 633-639).

- We have used microarray analysis to characterise which of 6000 genes are active at various times during coral embryonic development. This work is allowing us to discover previously unknown gene interactions which may be critical at various stages of development.

- Analysis of the role of the mouse Flil gene, has led to a provisional patent on the role of this gene in wound healing. Analysis of the Flil gene in the nematode *Caenorhabditis elegans* using RNAi, yeast-two-hybrid analysis, and microarray analysis has revealed novel, fundamental aspects of the biology of Flil and its interacting partners, including a role in oocyte development.

- Analysis of genetic modifiers of a Rho family small GTPase activator revealed an otherwise cryptic mechanism of cell cycle regulation operating in the developing *Drosophila* eye, a favoured tissue for the analysis of developmental regulatory mechanisms. The transcription factor, Net, is required to repress entry of cells into M phase in the differentiating region of the developing eye tissue.