

## Current Research Interests and Subject Areas Available for Graduate Research

My research interests fall into two closely-related areas: the quantitative analysis of developmental variation and the effects of stresses on the mutation rate. Both are elements of the more general problem of multi-gene systems acting as a buffering mechanism for genetic and developmental stability. We bring these together in questions like the importance of variation in mutation rate, mutation in the process of aging and response to environmental stress, and the role of genotype  $\times$  environment interactions in facilitating adaptation to novel environments and speciation. *Drosophila melanogaster* is our principal experimental organism. Many important aspects of development vary, and the study of that variation can provide insights into mechanisms of genetic regulation and developmental homeostasis.

Quantitative morphometric assays of developmental symmetry (fluctuating asymmetry) provide a useful tool for studying developmental quality under stress, and we currently use wing venation landmarks and various sensory structures in *Drosophila* as model systems. We are beginning to complement this with proteomic assays. Stress resistant and stress sensitive genotypes provide a background of genetic variation, and physical stresses include hypergravity, vibration, low level radiation, and possibly microgravity.

Finally, mutation rate is also a potentially variable trait that can have a significant effect upon the structure and composition of a gene pool. By assessing factors such as the frequency of premeiotic mutation leading to clusters of identical mutations entering the gene pool at one time, we are developing models of mutation rate heterogeneity in populations and estimates of the effects of such mutation clustering.

To learn more about this research, visit [Dr. Thompson's web page](#).

## Representative Recent Publications

- Gong, Y., R.C. Woodruff, and J.N. Thompson, jr. 2005. Deleterious genomic mutation rate for viability in *Drosophila melanogaster* using concomitant sibling controls. Royal Society, *Biology Letters* 1(4): 492-495.
- Thompson, J.N., jr. 2004. Book Review: *Chemoecology of Insect Eggs and Egg Deposition*. *Quarterly Review of Biology* 79: 211-212.
- Thompson, J.N., jr., J.J. Hellack, G. Braver, and D.S. Durica. in press. *Primer of Genetic Analysis: A Problems Approach*, third edition. Cambridge University Press, Cambridge, UK.
- Williams, A.J., and J.N. Thompson, jr. 2005. Stress effects on spatial pattern of *Drosophila* wing sensilla in stress-sensitive and resistant genotypes. *Dros. Inf. Serv.* 88: 75- 79.
- Woodruff, R.C., and J.N. Thompson, jr. 2002. Mutation and premating isolation. *Genetica* 116: 371-382.
- Woodruff, R.C., and J.N. Thompson, jr. 2002. Transposons as natural and experimental mutagens. *Encyclopedia of Life Sciences*.

- Woodruff, R.C., and J.N. Thompson, jr. 2003. The role of somatic and germline mutations in aging and a mutation interaction model of aging. *J. Anti-Aging Medicine* 6: 29-39.
- Woodruff, R.C., J.N. Thompson, jr., and S. Gu. 2004. Premeiotic clusters of mutation and the cost of natural selection. *J. Heredity* 95: 277-283.
- Woodruff, R.C., and J.N. Thompson, jr. 2005. The fundamental theorem of neutral evolution: rates of substitution and mutation should factor in premeiotic clusters. *Genetica* 125: 333-339.