

**A Coalescent Dual Process
in a Moran model with Genic Selection**

Bob Griffiths

University of Oxford

Joint research with Alison Etheridge

Abstract

A coalescent dual process for a multi-type Moran model with genic selection can be derived using a generator approach. This leads to an expansion of the transition functions in the Moran model and the Wright-Fisher diffusion process limit in terms of the transition functions for the coalescent dual. A graphical representation of the Moran model identifies the dual as a strong dual process following typed lines backwards in time. An application is made to the harmonic measure problem of finding the joint probability distribution of the time to the first loss of an allele from the population and the distribution of the surviving alleles at the time of loss. The dual process mirrors the Ancestral Selection Graph of Krone and Neuhauser (1997) and Neuhauser and Krone (1997), which allows one to reconstruct the genealogy of a random sample from a population subject to genic selection. There are also links to dual processes in Stephens and Donnelly (2002) and Fearnhead (2002). This research extends a dual process construction in a Wright-Fisher diffusion in Barbour, Ethier and Griffiths (2000).