

Neutral Versus Selection: A Critical Phenomenon

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Abstract:

The Wright-Fisher Markov chain model in population genetics describes the evolution of allele proportions under the influence of mutation, selection and random genetic drift. The diffusion approximation to the Markov chain is called Wright-Fisher diffusion. The infinite dimensional generalization is a special Fleming-Viot process: the infinitely-many-alleles model. The model is called neutral if there is no selection.

An interesting problem in population genetics is to test the neutrality against the selection alternative. Through the study of the equilibrium behaviour of a neutral model for large mutation rate and compare it with the corresponding selection model, a critical phenomenon is revealed in terms of the ratio between the intensities of mutation and selection. This leads to an alternate proof of a conjecture proposed by J.H. Gillespie in 1999. The result is a joint work with D.A. Dawson.