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Lee Altenberg* (altenber@hawaii.edu), 1680 East-West Rd, Rm 317, Honolulu, HI 96822-2327. *Spectral Graph Theory in the Analysis of Biological Evolution*.

Weighted graphs can be used to model biological evolution under natural selection and mutation: vertices correspond to genotypes, edges correspond to mutation from one genotype to another, vertex weights correspond to fitnesses, and edge weights correspond to mutation rates. Weinberger, Stadler, Grover and others have used Fourier decompositions of the vertex weights in terms of the eigenvectors of the edge weights, in order to characterize the "ruggedness" of these "adaptive landscapes". This Fourier analysis has been used to characterize random walks on the graphs. But it has not been used in the actual evolutionary population dynamics under selection and mutation. Here we find that the original spectral graph results of Collatz and Sinogowitz (1957) appear as a lower bound on the asymptotic mean fitness of the population, and the spectral gap of the mutation matrix appears in an upper bound. This reveals an intimate connection between robustness of a population to mutation and the relaxation times of population perturbations due to mutation. (Received January 28, 2019)