résumé :

Genetic correlations between traits can constrain responses to natural selection. To what extent such correlations limit adaptation depends on patterns of directional selection. I derive the expected rate of adaptation (or evolvability) under randomly changing selection gradients. When directional selection gradients have an arbitrary covariance matrix, the average rate of adaptation depends on genetic correlations between traits, contrary to the isotropic case investigated in previous studies. Adaptation may be faster on average with more genetic correlation between traits, if these traits are selected to change jointly more often than the average pair of traits. However, natural selection maximizes the long-term fitness of a population, not necessarily its rate of adaptation. I therefore derive the average lag load caused by deviations of the mean phenotype from an optimum, under several forms of environmental changes typically experienced by natural populations, both stochastic and deterministic. Simple formulas are produced for how the G matrix affects long-term fitness in these contexts, and I discuss how their parameters can be estimated empirically.