

# The factors that favor adaptive habitat construction versus non-adaptive environmental conditioning

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## Abstract

Adaptive habitat construction is a process by which individuals alter their environment so as to increase their (inclusive) fitness. Such alterations are a subset of the myriad ways that individuals condition their environment. We present an individual-based model of habitat construction to explore what factors might favor selection when the benefits of environmental alterations are shared by individuals of the same species. Our results confirm the predictions of inclusive fitness and group selection theory and expectations based on previous models that construction will be more favored when its benefits are more likely to be directed to self or near kin. We found that temporal variation had no effect on the evolution of construction. For spatial heterogeneity, construction was disfavored when the spatial pattern of movement did not match the spatial pattern of environmental heterogeneity, especially when there was spatial heterogeneity in the optimal amount of construction. Under those conditions, very strong selection was necessary to favor genetic differentiation of construction propensity among demes. We put forth a constitutive theory for the evolution of adaptive habitat construction that unifies our model with previous verbal and quantitative models into a formal conceptual framework.

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