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Noise-Optimized Speciation in a Simple Evolutionary Model
NATHAN DEES, SONYA BAHAR, Dept. of Physics and Astronomy and Center for Neurodynamics, University of Missouri at St. Louis — A simple computational model for Darwinian evolution is constructed based on three minimal requirements: inheritance, variability, and overpopulation. The fitness of organisms is based on their position in a two-dimensional fitness landscape which is changed periodically either by random fluctuations, or via a feedback mechanism based on the number of organisms in close proximity. The clustering of organisms in a morphospace overlaid on this landscape is considered an analog of speciation and is investigated as a function of the degree of variability, or "noise", allowed in the morphology of new (children) organisms with respect to their parents. We find that a maximum number of species are formed at an intermediate value of this noise parameter, suggesting a stochastic resonance-like effect. We also address the spread of inherited traits through the overall population, finding an "all or none" effect in which the properties of a traced organism either die out completely or percolate through the entire population, leading to what might be considered as "homologous" traits even in species widely separated in morphospace.

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