Project Summary

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I am performing a quantitative analysis of evolutionary mutation's effect on complexity. If you define complexity as the number of vital parts necessary to survive and reproduce, it becomes clear that as organisms increase in complexity they become progressively more "brittle" and it is more likely for an errant mutation to cause disaster. The first answer to this problem might be simply to minimize the magnitude or rate of mutations, but this is not a good approach as it diminishes evolution's ability to generate wide genetic diversity and decreases the speed of evolution itself.

In the natural world, more complicated biological organisms can cope with the risk of catastrophic errant mutations with genetic redundancy and robust biological mechanisms. I am creating artificial life and genetic algorithm simulations exploring the long-term effects of mutations on organisms of varying complexity and genetic redundancy. Through our research we hope to find general trends in the evolutionary robustness of complex organisms as well as genetic "sweet spots" which allow strong utilization of both complexity and adaptive mutations.