

DARWINIAN AND NON-DARWINIAN EVOLUTION

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1. Introduction

Evolution by natural selection, by survival and differential reproduction of the fittest, is about as firmly established as any broadly general scientific theory could imaginably be. Why then should it be challenged by a rival theory in 1971? The answer is that it is not, for the proponents of non-Darwinian evolution are not questioning that evolution of form and function has occurred in the orthodox neo-Darwinian manner.

So let me first say what non-Darwinian evolution is not. It is not orthogenesis, emergent evolution, inheritance of acquired characters, catastrophism, vitalism, inherent directiveness, or telefinalism. It is not associated with names such as Lamarck, Osborn, or Teilhard de Chardin. Rather it is evolution by random drift of mutants whose effects are so minute as to render them essentially neutral, and a more appropriate name to mention is Sewall Wright.

Random drift is not a new idea. It was considered quite thoroughly by R. A. Fisher [10] and discounted by him as a factor of any great interest in evolution. He regarded it as a calculable amount of random uncertainty that could cause disorderly fluctuations, but would not alter to any great extent either the direction or the rate of evolution, except in very small populations. To Sewall Wright [47], [48], [50], on the other hand, random gene frequency fluctuations became an important part of his shifting balance theory of evolution. Random fluctuations may enable a population to pass to the other side of an unstable equilibrium, or in a structured population permit a particularly favorable gene combination to arise locally and spread through the entire population. In Wright's view, random drift caused by near neutrality, small population size, and fluctuating selective values is part of a basic mechanism that enhances the probability of evolutionary novelty.

Random drift in the present context is different in emphasis. The idea put forth as non-Darwinian evolution is that most DNA changes and most amino acid substitutions in evolution have been so nearly neutral that their fate was determined mainly by random processes. In this view the chief cause of observed molecular evolution is random fixation of neutral mutations. The effect of all this on fitness is regarded as negligible.