

Review of *Mutation, Randomness, and Evolution*, by Arlin Stoltzfus

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Keywords


mutation • randomness • evolutionary biology

While written by an evolutionary biologist, *Mutation, Randomness, and Evolution* (Stoltzfus 2021) is thoroughly grounded in contemporary history and philosophy of biology and has much to say to biologists and humanists alike. Stoltzfus invites us to re-think the nature of genetic variation as it bears on evolutionary processes. In particular, *Mutation, Randomness, and Evolution* challenges us to reconsider what it means to say that mutations are random. Because this claim to mutational randomness has been an established tenet of neo-Darwinian evolution, its rejection has important consequences, which Stoltzfus lays out in careful detail.

Mutation, Randomness, and Evolution's ten chapters set up the problems of randomness in evolutionary biology in chapters 1 through 7 before offering a theoretical and empirical resolution to the various challenges that an account of evolutionarily relevant randomness requires. For Stoltzfus, randomness is a problem for evolution in two senses: on the one hand, there are a set of conceptual and empirical questions regarding what is meant when investigating the randomness of mutation, and on the other hand, there are a set of questions regarding why certain views on the randomness of mutation have become entrenched in twentieth-century biology. One of the upshots of this book is that the entrenched view that all mutations are random may not be justified, and we are hanging on to it for all the wrong reasons.

As a biology book, *Mutation, Randomness, and Evolution* reviews the considerable literature on mutation: the mechanisms that produce them, in what sense are they directed, in what sense are they random, and what role they play in evolutionary processes. As a philosophy of biology book, Stoltzfus's text raises questions about what constitutes randomness in evolution, the nature of developmental and mutational biases, and the inadequacy of considering evolution as a theory of forces. As a history book, *Mutation, Randomness, and Evolution* is a revisionist critique of history of evolutionary biology that produced the idea of a selectionist consensus under the umbrella of the evolutionary synthesis.

Stoltzfus's central preoccupation is how claims about the randomness of mutation were used to sideline it as a cause of evolution. Mutation could randomly produce new variants on this view, but its actions were independent of selection and so is irrelevant to the processes of selection that "really matter" in evolutionary biology. In its place, Stoltzfus champions a view of evolution as

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mutation-biased in such a way that mutation becomes a significant causal actor in patterns of evolution including adaptive evolution.

Stoltzfus wants us to stop putting “mutation in a black box” (214). As he shows, there are multiple processes that generate mutations. We cannot afford to erase the differences in these processes of production because the results are not the same, and different processes produce different dispositions that are acted upon in the subsequent evolutionary processes of substitution. This more careful attention to mutation, according to Stoltzfus, moves it from background to center stage in the selective processes of evolution.

Throughout his book, Stoltzfus is arguing against overly externalist theories of evolution that make selection the only causal agent of interest. His answer is not to champion overly internalist theories that make genetics and development the chief causal agents of evolution, but to appreciate a more complex and contingent mix of internal and external factors in evolutionary explanations. In his view, a more complex understanding of the pre-dispositional role of mutation should be a part of that approach to evolutionary theory that does not give way to panselectionism. In doing so, he makes a case for biases in variation that have an impact on evolution. These are not merely changes in patterns of neutral evolution, genomic structure, or codon usage, but changes with “important” implications for adaptive traits.

Mutation, Randomness, and Evolution is a rich mix of science, history, and philosophy that poses an important set of challenges regarding deeply held views on the randomness of mutation and its place in evolutionary thinking. Stoltzfus’s arguments merit careful consideration by philosophers of biology interested in a more complex and nuanced understanding of the variety of causes of evolution.

Literature cited

Stoltzfus, Arlin. 2021. *Mutation, Randomness, and Evolution*. Oxford, UK: Oxford University Press.

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