Multilevel Mechanisms of Evolutionary Change

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Abstract

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Theodosius Dobzhansky in his1937 Genetics and the Origin of Species claimed that "the mechanisms of evolution as seen by a geneticist" consist of mechanisms at three levels. This multilevel analysis still captures the key mechanisms of evolutionary change. First, mechanisms produce the variations that are the raw material for change, including mutation mechanisms of imperfect copying of DNA (including repair mechanisms), as well as larger scale chromosomal changes and recombination. The second level includes mechanisms that change populations, genotypically and phenotypically. The most important is the mechanism of natural selection, which is the only known mechanism for producing adaptations. In the natural selection mechanism, the crucial joint activities of variant organisms and a critical environmental factor produce populational changes in subsequent generations. Finally, isolating mechanisms give rise to new species that are reproductively isolated from previous conspecifics. This paper argues that natural selection is, indeed, a mechanism (despite recent claims to the contrary) and places the natural selection mechanism into the context of the multilevel mechanisms of evolutionary change.

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