

Abstract Submitted
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Three Laws in Darwinian Evolutionary Theory PING AO, University of Washington — Recent works to formulate laws in Darwinian evolutionary dynamics will be discussed. Specifically, three laws which form a consistent mathematical framework for the evolutionary dynamics in biology will be spelt out. The second law is most quantitative and is explicitly expressed in the unique form of a stochastic differential equation. Salient features of Darwinian evolutionary dynamics are captured by this law: the probabilistic nature of evolution, ascendancy, and the adaptive landscape. Four dynamical elements are introduced in this formulation: the ascendant matrix, the transverse matrix, the Wright evolutionary potential, and the stochastic drive. The first law may be regarded as a special case of the second law. It gives the reference point to discuss the evolutionary dynamics. The third law describes the relationship between the focused level of description to its lower and higher ones, and defines the dichotomy of deterministic and stochastic drives. It is an acknowledgement of the hierarchical structure in biology. A new interpretation of Fisher's fundamental theorem of natural selection is provided in terms of the F-Theorem.

Ref.

P. Ao, Physics of Life Reviews 2 (2005) 117-156.

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