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Stephen J. Gould's Legacy: Nature, History, Society

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Biological complexity and punctuated equilibria

Abstract

The Modern Synthesis and particularly population genetics, were based on a mechanistic conception of life stemming from the Mendelian conception according to which living systems were fully determined by discrete elements randomly assorted every generation. According to this conception evolution was considered a continuous process of improvement through adaptation to the same (R.A. Fisher) or changing environment (S. Wright). The punctuated equilibria theory by Gould and Eldredge successfully challenged this conception on the ground of paleontological findings. However until the nineties of the twentieth century molecular and physiological demonstrations of processes leading to "sudden" changes in the speed of evolutionary modifications of organisms have been lacking. The present talk, after an introduction on the specific structure of biological complex systems, will discuss the dynamics of interactions between the different sources of variability and the constraints due to connections between components of living systems throughout the hierarchical organization of life inevitably leading to the changes in the speed of morphological and physiological modifications proposed by Gould and Eldredge.