



Answering Wallace's riddle: How evolution achieves hierarchic complexity

By

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Prof. Terrence Deacon is professor and Chairman of the Department of Anthropology at University of California, Berkeley.

His research combines human evolutionary biology and neuroscience with a focus on the evolution of human language and cognition. His book, *The Symbolic Species: The Co-evolution of Language and the Brain* is considered to be a seminal work in the subject of evolutionary cognition.

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Brains are the most complex organs of a body, and language is an enormously complex form of behavior. How can such complex synergies evolve? The evolution of complexity is generally assumed to be explained entirely in terms of natural selection or sexual selection. Wallace argued that selection is insufficient to explain the extravagant complexity of brains and languages. The growing recognition of the importance of epigenetic processes in evolution has demonstrated another contributor to the evolution of complexity. Paradoxically, relaxation of selection may be critical to the evolution of complex synergies because it allows spontaneous degradation of functional autonomy at the componential level (e.g. cells) leading to increased co-dependence of functions at a higher level of organization. It also releases constraints on self-organizing and selection processes during development. The result is an internalization of former ecological relationships and a shift from competition to higher order functional synergies. Examples from gene duplication, body segmentation, vitamin C dependency, effects of domestication on bird-song, and language evolution will be described to demonstrate this effect.

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