Deep homology in mirror neurons? Epistemic problems with the extrapolation of evo-devo schemes in cognitive science

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Abstract

Evolutionary developmental biology (evo-devo) and cognitive science have been lately brought together by philosophers of biology, but the methodological/theoretical complementarities between these two disciplines have not yet been analyzed in detail. This paper addresses epistemic issues related to the extrapolation of (i) well-established inference strategies employed in developmental genetic and morphological evo-devo studies of homology into (ii) the cognitive science/primatology realm, where comparative description of behavioral traits is characteristically included at upper hierarchical levels. We analyze a specific example of such interdisciplinary extrapolation –namely, de Waal and Ferrari's postulation of mirror neuron-based homologous neural substrates for imitation behaviors in primates– and detect a problematic use of the notion of *deep homology*. In this particular cognitive primatology case –which involves functional, as well as structural homology considerations– information on the gene- or gene regulatory network-related substrate for the differentiation of mirror neurons in different primate species is lacking, therefore complicating inferences intrinsic to deep homology arguments, as conducted in more traditional evo-devo studies. Our analysis rests on well-known conceptual treatments (Abouheif; Bolker & Raff; Wagner; others) of the complexities associated to the definition of homology in biology when multiple levels of organization are implicated. We conclude with a brief comment on epistemological approaches to the interface between evo-devo and primatology/biological anthropology-oriented cognitive science.

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