
Articulating mechanisms and topologies as mutually required in explanatory strategies.

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Abstract

SessionThe space of explanations in evolutionary biology. (Ariew A., Darden L., Huneman P., Lyon A., Strevens M., Walsh D.)

abstract: Evolutionary biology displays topological explanations, namely explanations which, instead of considering underlying mechanisms, explain by pinpointing topological properties of abstract spaces (such as food-webs) associated to the system, which entail the explananda (Huneman 2010). This is often used to explain the stability of an ecological community (e.g. Montoya, Solé 2002). I will investigate how mechanistic and topological explanations are connected in evolutionary theory.

Prima facie they are answering different questions: mechanisms are used to investigate the production of these topological structures (e.g. scale-free food webs) which possess the properties used as explanantia in topological explanations (e.g., specific mechanisms of predation may yield food webs of a given topological nature). Here, mechanistic explanations explain what makes topological explanations possible.

However, I here consider two reverse relations, less self-evident. 1. The mechanisms of allele frequency changes in populations are modeled by population genetics; yet such modeling has to make assumptions, about especially the possibility of bracketing development, and about considering the dynamics of a few loci as capable of representing the whole dynamics in the genomes population. Such assumptions will be characterized in terms of topological properties of genotype/phenotype maps, because what is required is the mappings to be conservative of some kinds of neighborhoods. 2. Modeling selection over fitness landscapes may involve mechanisms of trait optimization, but only under some conditions of local invariance of the landscape, which are topological conditions.

Hence a two-ways relation: topological (resp. mechanistic) explanations can provide conditions of validity for mechanistic (resp. topological) explanations.

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