Distinguishing ecological from evolutionary approaches to transposable elements

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Abstract

Session: Ecological explanation at different levels and scales (Stefan Linquist, Karl Cottenie, Jérôme Chave). Considerable variation exists not only in the kinds of transposable elements (TEs) occurring within the genomes of different species, but also in their abundance and distribution. Noting a similarity to the assortment of organisms among ecosystems, some researchers have called for an ecological approach to the study of transposon dynamics. However, there are several ways to adopt such an approach, and it is sometimes unclear what an ecological perspective adds to the existing co-evolutionary framework for explaining transposon-host interactions. At a more fundamental level, the application of ecological thinking to TEs raises the question of what is distinctive about an ecological, as opposed to an evolutionary approach, in general. To address these issues, we offer an operational distinction between ecology and evolution. This framework allows one to quantify how much of a given pattern calls for ecological and evolutionary explanations, respectively. To illustrate how this framework applies to a concrete example, we analyzed whole-genome data for one set of distantly related mammals and another more closely related group of arthropods. Ecological factors explained most of the variation in TE abundance and distribution among closely related organisms. Evolutionary factors were not significant at this level. However, the explanatory roles of evolution and ecology become inverted at the level of TE families, or, among more distantly related genomes. The fact that ecological processes impact TE lineages over relatively short time scales further raises the possibility that transposons might serve as useful model systems for testing more general hypotheses in ecology.

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