Phenotypic variation in ecological setting: a challenge for evolutionary modeling beyond the Modern Synthesis

Serrelli Emanuele*[2,1]

[2]"Riccardo Massa" Department of Human Sciences, University of Milano Bicocca – Piazza dell'Ateneo Nuovo 1 20126 Milano ITALY, Italy

[1]Applied Evolutionary Epistemology Lab, Center for Philosophy of Science, Faculty of Science, University of Lisbon (AppEEL) – Portugal

Abstract

Session: Understanding variation beyond the Modern Synthesis (Gontier, Razeto-Barry & Vecchi, Serrelli) Organisms are niche constructors: they impact the environment and modify selective pressures that direct their own evolution as well as that of their non-conspecific fellows in ecological systems at various scales. The theoretical acknowledgement of niche construction has inspired many reflections about the active role of organisms in evolution, often proclaiming a revolutionary theoretical change. But if we look at formal models the claim is not yet justified. Ecologists have specified population-scale models of niche construction, but these cannot be adopted as evolutionary models: they don't incorporate heritable variation nor allow for directional selection and cumulative change. As evolutionists point out, these models are mere phenotype dynamics or population fluctuations with different possible outcomes - extinction or sustainability. Evolutionary models of niche construction, on the other hand, are not so revolutionary in their foundations, often being just classical population genetics provided with feedback loops between loci and selective pressures acting on them. The idea that variation among organisms boils down to genetic differences captured by gene frequencies dates back to the heart of the Modern Synthesis. But niche construction points directly to the world of physical and chemical interactions. This is the world where resource-impacting phenotypes are built through developmental processes, in turn subject and sensitive to the surrounding environment and the resources left over by previous generations. The produced phenotypes and their effects are hardly summarized by gene frequencies, yet evolutionary models need some kind of heritable variation and selection. The future challenge of evolutionary modeling beyond the Modern Synthesis is thus ecological, plastic variation that allows for inheritance with varying degrees and not-always-allelic mechanisms.

*Speaker