

The Generalized Theory of Evolution, January 31–February 3, 2018, Dusseldorf

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A group of scholars from a broad range of disciplines, from humanities and hard sciences, met at the Haus der Universitaet, Schadowplatz 14, at the Dusseldorf Center for Logic and Philosophy of Science (DCLPS), University of Dusseldorf, with the aim of critically discussing the viability of a new synthesis between the biological and the social sciences, with the evolutionary theory serving as the epistemological backbone of such a synthesis.

The conference, at its inaugural edition, was held between January 31 and February 3 and it was organized by Karim Baraghith, Christian J. Feldbacher-Escamilla, Corina Strößner and Gerhard Schurz, from the DCLPS of the University of Dusseldorf.

Two parallel sessions were alternated by two plenary lectures every day. 7 plenary lectures were given by the invited speakers Daniel Dennett (Tufts University), Eva Jablonka (Tel Aviv University), Ruth Mace (University College London), Alex Mesoudi (University of Exeter), Thomas Reydon (University of Hannover), Gerhard Schurz (University of Dusseldorf), Brian Skyrms (University of California, Irvine). The full programme and the book of abstracts are available at the conference website: <https://dclps.phil.hhu.de/genevo/programme>.

For several decades now scholars from various disciplines have used evolutionary theory and models to tackle social phenomena such as the spread of human culture, broadly conceived (Cavalli Sforza and Feldman 1981; Boyd and Richerson 1985). The initial trigger of cultural evolutionary research was the intuition that processes of variation, reproduction and differential survival regulate cultural diffusion. Therefore it has been argued that the methodological tools of population genetics, which were developed during the Modern Synthesis and were exploited to explain the spread of biological traits, can in principle be used to explain the distribution of cultural traits. However, despite the analogies between biological and cultural evolutionary processes, some crucial differences

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exist as well: mutation is not the only source of variation, as transformative processes (due to cognitive biases among the other factors) play a large role in the cultural domain; variation is not always blind, inheritance can be blended rather than particulate and it can occur both horizontally and obliquely rather than only vertically.

Nonetheless, culture evolved from the biological realm, it evolves on its own time-scale following its own rules and it sometimes co-evolves with genes. Given so many angles from which these issues can be addressed, participants with different backgrounds brought a heterogeneous set of methodological approaches at the conference: memetics (Dawkins 1976), dual inheritance theory (Boyd and Richerson 1985), attraction theory (Sperber 1996), Darwinian (Mesoudi 2011) and Lamarckian (Gissis and Jablonka 2011) evolution, game theory in signaling systems (Skyrms 2010). Key differences between Cultural Evolution and Social Darwinism (Spencer 1897) were discussed during the opening evening round table among the conference organizers, the invited speakers and the attendees. Moreover, as other tentative syntheses between biology and culture have already been proposed, presentations and debates covered also the following frameworks: Universal Darwinism (Dawkins 2010), the Evolutionary Extended Synthesis (Pigliucci and Müller 2010; Laland et al. 2015), Sociobiology (Wilson 1975), Evolutionary Psychology (Tooby and Cosmides 1992), Evolutionary Ethics and Evolutionary Epistemology. Each one of these approaches displays both advantages and limits.

The invited speakers' lectures, as well as the associated discussions, reflected this heterogeneity and interdisciplinarity.

Philosopher of science Daniel Dennett illustrated its memetic approach to culture: memes are discrete, informational, replicating entities, gradually evolving by cultural natural selection; we humans download thinking tools into our "necktop", that is a software-like mind provided with digitization, the key neural tool allowing for high-fidelity transmission of traits (cumulative culture) on which selection can act. Words, Dennett argued, are the best examples of memes, they are socially learned and transmitted, they infect our brains and they gradually evolve by a blind process of natural selection. The first memes were adopted unwittingly, but humans ultimately evolved into memes intelligent designers: this is what Dennett calls a de-Darwinization of cultural evolution, but this reflectiveness about memes came only very recently in evolutionary terms.

According to these analogies between genes and memes as discrete genetic and cultural information units respectively, population genetics tools, which were developed during the Modern Synthesis, can be properly applied to study the evolution of cultural traits within a population, as it was shown by philosopher of science Gerhard Schurz. However, not everybody agreed on such an explanation, as it was argued that the very analogy between memes and genes has several limits.

First, memes in our brains are usually conceived as causes of behavioral patterns, but the opposite might be true as well: taking a cultural approach to cognitive evolution, culturally transmitted behavioral patterns can be viewed as causes of the persistence of memes in our brains. Secondly, the impact of natural selection on memes like words can be questioned too: words differential survival might be much more affected by language extinctions in the last hundreds years rather than by cultural natural selection. Moreover, Dennett's memetic approach relies on the assumption that we have digitization in the brain; however, as Alex Mesoudi pointed out, it is up to neuroscientific and cognitive empirical research to state whether cultural transmission is particulate or non-particulate and how cumulative culture is actually implemented at the neural level. Till then, that area should be black-boxed.

According to Alex Mesoudi, a crucial step towards a proper synthesis comes from quantitative modeling, a research strategy that Mesoudi himself tried to pursue throughout his own career, having worked in Anthropology, Psychology and Biology Departments across Europe. These models should aim at integrating variation and selection on one side and transformative processes on the other side. The former would explain the evolution of cultural complexity and diversity, the latter would explain cultural universals. Moreover, he argued that two major components are rather underestimated today: stochasticity (Billiard and Alvergne 2018) and a multilevel approach to culture. It takes a long way to finalize a proper synthesis between biological and cultural evolution, Mesoudi argued, and many pieces should fall in place: these include developing a proper cultural phylogenetic approach and integrating cultural micro and macro-evolutionary processes (see Mesoudi 2011, Fig. 10.1, p. 211).

Philosopher of biology and geneticist Eva Jablonka argued that a Developmental System Theory (DST) approach to culture can also lead to fundamental insights. Culture, intended as a set of reconstructed patterns of behaviors and ideas within a community, should be understood as a dynamic socially acquired system. From a developmental perspective, a meme is the product of a developmental process, it is subject both to stabilization and perturbation dynamics. We can think of these patterns as trajectories in a Waddingtonian “social landscape” (Waddington 1957), where human behaviors are open ended processes which are affected both by plasticity and canalization. In this framework, it is also possible to draw some predictions: sign language was introduced in the nineteenth century and deaf people doubled in the last 200 years; assortative mating within the deaf community occurred, leading to an increase of homozygosity and connexin deafness probably increased as a result. If cochlea implantation will spread in the next decades, Jablonka argues, we should expect assortative mating and homozygosity to go down and connexin deafness to decrease.

Another major topic of the conference was represented by evolutionary dynamics in signaling games, an approach very much pursued and developed by game theory expert Brian Skyrms. Despite the fact that the term information is often used in a rather informal way in evolution, in signaling games it is a measure of probability (Shannon and Weaver 1948). Signaling networks and information exchanges evolve and such an evolutionary dynamic can lead to explain the emergence of meaning in functional terms.

Evolutionary biologist Ruth Mace argued that, in order to deal with a proper understanding of human behavior across the globe, no specific upgrades or new syntheses are necessarily required. Behavioral ecology and classical ethological methodology instead will suffice. A trait should be understood in terms of proximate (mechanism and development) and ultimate (function and phylogeny) causes (Tinbergen 1963), according to Mace. As an example, she illustrated the case of the evolution of matrilineal societies, presenting her studies on Mosuo population in China (Ji et al. 2013).

Philosopher of science Thomas Reydon discussed what is needed in order to make an epistemological synthesis operational: ontological commonalities between entities are a fundamental requirement. The case study of the evolution of gas stations by Usher and Evans (1996) was discussed, and much attention was given to the definition of the notion of “population”, an open issue in cultural studies.

The two parallel sessions brought in the arena of discussion other topics which were grouped in four main categories: generalized evolutionary modeling, communication and language, complexity and evo-devo. Some of the most debated issues are here summarized: the notions of function, fitness (and inclusive fitness), individuality and population, both in biology and culture; the strength of natural selection relative to other evolutionary

forces; the role of niche construction and the role of evolutionary feedback processes; the co-existence and the reciprocal influence of different forms of inheritance; the role of self-organization and related complexity theories; the definition of the target of selection, the unit of variation and the unit of evolution, as three entities that might often be decoupled; the definition of culture in informational terms; how interdisciplinarity can be implemented in a synthesis between biological and social sciences.

The organizers are willing to keep the conference website active for some time in order to make use of it as a repository for generalized theory of evolution related contents. The repository hosts video recordings of the keynote speakers' lectures, the video of the round table, as well as a list of presentation slides submitted by the speakers of the conference: <https://dclps.phil.hhu.de/genevo/repository>.

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