Comparison of biological and cultural evolution

Biological evolution is a population-level process guided by selection, and it leads to an increase of the adaptation of the population for the environmental circumstances in which the population lives. Culture can be defined as the wholeness of the mental and material achievements of a society or mankind as a whole. The theory of cultural evolution provides an explanation for how cultures and societies change over time.

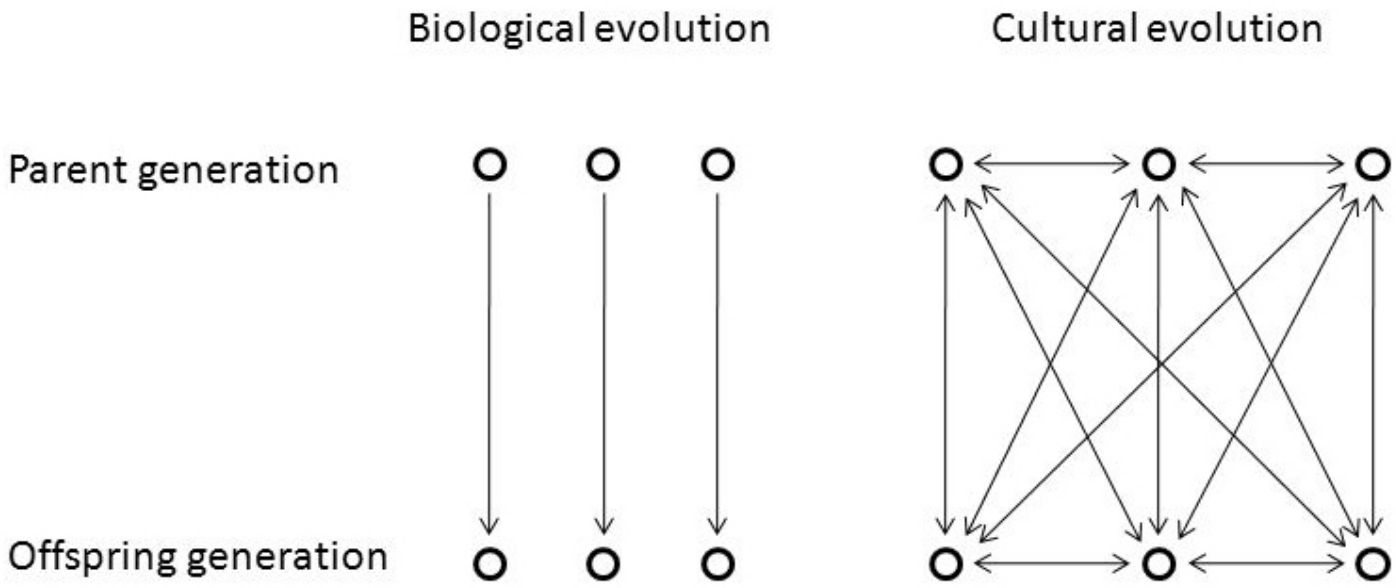

Fig. 1. Transfer of information in biological and cultural evolution. In biological evolution, the transfer is unidirectional and vertical, whereas in cultural evolution it is bidirectional, and vertical, horizontal or oblique – in other words, network-like.

Biological and cultural evolution have certain similarities but also many dissimilarities. Both are based on variation, heredity and selection, but how these appear and work differ. Biological evolution is unconscious, opportunistic and not goal-directed, while cultural evolution is conscious, at best planned, and can have a goal. In the biological world the sources of variation are mutations and genetic recombination. Heredity is connected with reproduction, and is mediated to subsequent generations via the genetic material. Selection operates in two ways, natural selection and sexual selection.

Natural selection is a force that selects which variants will survive and get offspring capable for reproduction. Sexual selection means that by selecting their sexual partners organisms in fact select for genes which the offspring receive from the partner. Thus, the two forms of selection operating in the biological world determine how the relative frequencies of different gene forms and

gene combinations evolve in a given population, and this process is the very essence of the biological evolution. By this way the mean fitness of the population increases as long as there exists genetic variation in fitness in the population. In other words, the adaptation of the population for the environmental circumstances continuously increases.

In the regime of human culture the sources of variation are certain acts based on human creativity, such as innovations for instance. In cultural evolution imitation and certain more advanced forms of learning constitute the equivalent of heredity of biological evolution. An important difference between biological and cultural evolution is the fact that in the former the inheritance of acquired characteristics is denied while in the latter it is an integral part of the theory. Moreover, in biological evolution the transfer of genetic information is unidirectional and vertical occurring from the parental generation to the offspring only, and occurs only once in each case. In cultural evolution on its part, the transfer of information is mainly based on immaterial spoken or written concepts, is bidirectional, and can also be horizontal or oblique i.e. network-like. Cultural information can also be stored, and the transfer of it can be repeated at will. These differences between biological and cultural evolution make the latter to be far more rapid than the former.

In cultural evolution a third form of selection is effective. This form of selection, termed social selection, involves competition on other social resources than the members of the opposite sex. In social selection, an important role is played by the feedback given by the members of the social group in which the individual in question lives. Therefore, in practice, in social selection the act of selection is performed by other individuals than the one whose fitness will be affected by the selection.

Cultural fitness deals with cultural characteristics such as thoughts and ideas, and is defined as a function of time. The longer a cultural characteristic is preserved in the population, the better its cultural fitness.

The importance of language as a necessary condition for cultural evolution should be stressed, language being the cultural replicator corresponding to the gene in biological evolution. Human creativity and mind reading, the specific human capacity of being aware what other people have in mind, are motors specific for cultural evolution.

Petter Portin
Laboratory of Genetics, Department of Biology
University of Turku, Turku, Finland

Publication

A comparison of biological and cultural evolution.

Portin P.
J Genet. 2015 Mar