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Intentional cultural change

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As a process of blind variation and selective retention, evolution lacks intentionality. Nevertheless, intentional processes can be a product of evolution and can double back to effect evolution. This article briefly describes how intentional processes evolve, how they figure in human cultural evolution, and how future cultural evolution needs to become more intentional.

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Evolution is typically described as a process of blind variation and selective retention [1]. In the standard portrayal of genetic evolution, mutations occur that are arbitrary with respect to their consequences for survival and reproduction (fitness). Those that enhance fitness increase in frequency until they become species-typical. The word ‘arbitrary’ rather than ‘random’ in the previous sentence is deliberate. If a mutation is random, then it results in a new phenotype that deviates from the previous phenotype in any direction with equal probability. The standard portrayal of genetic evolution does not assume that mutations are random in this sense. Instead, the assumption is that mutations do not anticipate the phenotypes that are favored by natural selection. This is the meaning of the word ‘arbitrary’.

An action is considered intentional when it is done on purpose. Synonyms include deliberate, calculated, meant, planned, pre-arranged, and considered. By these definitions, there is nothing about the standard portrayal of genetic evolution that can be called intentional. The standard portrayal quickly gets complicated by factors that can be called intentional, however. Genetic mutations are not always arbitrary with respect to their fitness consequences. Environmental change can trigger an increase in the rate of mutations and even selectively do so in regions of the chromosomes likely to result in adaptations to the

environmental change. Environmental change can also result in phenotypic changes that are inherited by offspring via epigenetic mechanisms (changes in gene expression rather than gene frequency). Such ‘Lamarckian’ processes were dogmatically rejected for decades but now they are becoming accepted as both theoretically plausible and empirically well supported [2^{*},3^{**},4^{**}].

Even when we stick to the standard portrayal of genetic evolution, natural selection clearly results in behaviors that deserve to be called intentional. An animal defending its territory means to do so and its actions are highly purposive toward that end. Natural selection results in intentional behaviors in all species, even when the process of natural selection is not intentional. Moreover, learned intentional behaviors can double back to influence the evolutionary process, a concept known as the Baldwin effect, which was regarded as a theoretical breakthrough when it was first proposed by the American psychologist James Mark Baldwin in 1896 [5,6^{*}]. As one well documented example, when some human populations started to domesticate livestock and drink their milk (a learned and culturally transmitted behavior), this altered selection pressures for the genetic evolution of lactose tolerance in adults [7].

Humans qualify as being capable of intentional behaviors, even according to the strictest definitions. Otherwise, the word and its equivalents would have no use in language. Barring creationist accounts, an evolutionary story is required to explain how the human capacity for intentional behaviors arose from less intentional processes. This project is similar to the project of explaining how purposeful behaviors in nonhuman species and directed genetic mutations evolve.

If learning has an intentional component, and if culture involves the transmission of learned information across generations, then cultural change will also have an intentional component (Tomasello, this issue). Yet, it would be absurd to propose that cultures are entirely a product of intentional design. Blind variation and selective retention still play a major role. To a large extent, cultures work without anyone designing them or knowing how they work [8,9^{*},10].

This article makes three contributions to the study of intentional cultural change. First, I will discuss the general problem of how a process that lacks intentionality can result in a product that has intentionality. Second, I will discuss the role of intentional processes in human cultural evolution during the past and present. Third, I will

discuss the need for human cultural change to become more intentional in the future.

How intentional behaviors evolve

Intentional behaviors are actions designed to achieve a given goal. For example, if the goal is to avoid predators, then actions might include hiding, fleeing, and fighting. Natural selection has endowed all organisms with goals that contribute to their survival and reproduction and a repertoire of behaviors for achieving the goals. In some cases the repertoire is a closed set of actions that are triggered by appropriate cues. For example, an animal might hide if a predator is at a distance, flee if the predator is too close, and fight if the predator is closing in.

In other cases, the repertoire of actions is more open-ended and based on a process of variation and selection. The adaptive component of the vertebrate immune system provides a good example [11]. Our bodies produce approximately 100 million different antibodies (variation), each capable of binding to a narrow range of organic surfaces. When a given antibody binds to an antigen, the cells that produce the antibody are stimulated to divide and ramp up their production (selection). Thanks to this rapid evolutionary process, we are capable of adapting to disease organisms that have managed to evade the innate (closed set) component of the immune system.

Operant conditioning is another well-known example of a rapid variation and selection process that adapts animals to their immediate circumstances [12]. In the experiments made famous by B.F. Skinner and others, animals vary their behaviors, adopt those that are rewarded (such as pressing a bar for a food pellet) and avoid those that are punished (such as staying away from one side of a cage to avoid an electric shock). Both the goals (e.g. to seek pleasure and avoid pain) and the variation in behavior are products of genetic evolution. For example, rats avoid novel foods when they are well fed but seek out novel foods when they are nutritionally stressed [13,14]. This is functionally equivalent to genes increasing their mutation rates under stressful environmental circumstances.

Skinner attempted to establish operant conditioning as a grand principle that could explain all forms of learning, including such things as language acquisition in humans. His attempt failed for at least two reasons. First, some learning is of the closed set variety — a fixed repertoire of behaviors triggered by environmental cues, as evolutionary psychologists such as Tooby and Cosmides [15] have pointed out. Second, advanced human capacities for symbolic thought, including but not restricted to language, cannot be explained in terms of operant conditioning, as psychologists such as Hayes [16] have pointed out.

Although some forms of open-ended human behavioral change cannot be explained in terms of operant conditioning, they still count as variation and selection processes [17]. Consider the process of explicit decision-making, whereby people deliberately review a set of options with a particular goal in mind. If anything counts as intentional change, it is this. Nevertheless, there is a strong random component to the options that are considered and some of the best come ‘out of the blue’, which is why brainstorming sessions are productive. When different people or groups are assigned the same complex decision-making problem, they typically come up with different solutions [18]. Likewise, evolutionary computer algorithms randomly generate alternative solutions that are evaluated with a particular goal in mind. In this fashion most open-ended intentional processes include a ‘blind variation’ component, as the evolutionary social psychologist Campbell [1] stressed long ago.

The role of intentional processes in human cultural evolution

In an important article titled ‘Emergency decisions, cultural selection mechanics and group selection’, Boehm [19] searched the anthropological literature for cases in which people were faced with an emergency and a skilled ethnographer was present to describe how they responded. He presented three case studies in detail, two involving warfare and the third involving a natural disaster. In all three cases, there was a deliberative group-level decision-making process that began with a review of the options and ended with the choice of a collective course of action. The main point of Boehm’s article was to stress the importance of intentional cultural change in indigenous societies, which is often overlooked.

On the other hand, consider one of the best studied examples of cultural replacement, which is described in detail by Kelly [20]. The Nuer are a pastoralist tribe occupying the Sudan region of Africa that were in the process of displacing a neighboring tribe called the Dinka when contacted by Europeans during the 19th century. Linguistic evidence makes it clear that the Nuer were historically derived from the Dinka as a clan that became distinctive enough to acquire its own identity. Both tribes raised cattle and grew millet, but a variety of practices gave the Nuer a greater incentive to embark on cattle raids (they needed a larger number of cattle to get married) and to be more successful in their raids (an extra layer of their kinship system enabled them to recruit a larger fighting force). The ‘Nuer conquest’ was not a deliberate campaign but just the cumulative result of many raids. There is no evidence that either the Dinka or the Nuer thought about their customs in relation to the cultural replacement that was taking place.

These two examples might sound contradictory but in fact they are compatible. It is likely that the Nuer and

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