

Cultural Transmission and Diffusion

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CONTENTS

Introduction

Cultural transmission processes

Cultural selection processes

Cultural traits

Artefacts

Memes, memetics and associated controversies

Conclusion

Cultural diffusion is the process by which information is disseminated through a population, typically by information exchanges among population members (cultural transmission), presumably with the involvement of social learning mechanisms.

INTRODUCTION

0724.001 People rely heavily on shared beliefs and values to coordinate their social activities. Indeed, phenomena from ritualized greetings to the elaborate ceremonies that mark social events such as marriage can partly be explained by referring to the need to fulfill shared behavioral expectations. These expectations derive from norms and standards specific to each social group. The set of behavioral practices specific to a group constitute a pool of information which is typically what people mean by 'culture'. In anthropology textbooks, for example, culture is typically defined as a 'system of shared beliefs, values, customs, behaviours, and artifacts that the members of society use to cope with their world and with one another, and that are transmitted from generation to generation through learning' (Bates and Plog, 1990: p. 7). How these kinds of information and practices come to be shared by different people in the first place remains to be explained, however, even though it is arguably a central question in the social sciences.

CULTURAL TRANSMISSION PROCESSES

0724.002 One explanation for shared culture is the exchange of information through social learning. However, considerable controversy attends this apparently common-sense notion. In particular, the recently burgeoning field of evolutionary psychology has claimed that much of what appears to be learned from others is in fact information already in place in people's brains – put there by a long history of

natural selection for the retention of that information, which remains ready to be elicited by circumstances. In effect, some ecological trigger sets off an appropriate innate response, making so-called 'culture' a store of mental records – just like the way a jukebox stores musical records, any one of which can be chosen by punching the appropriate button (Tooby and Cosmides, 1992). The fact that people in different places do different things therefore cannot be taken as evidence that culture is transmitted, since they may be simply responding as individuals to subtle environmental differences. The crucial issue, then, is to distinguish the social transmission of information from individual phenotypic plasticity.

Advocates of the position that human beings and other social animals in fact depend significantly on social learning typically suppose that the need to acquire up-to-date information derives from the need to deal with quickly changing ecological conditions – including, in particular, the sometimes ephemeral nature of relationships with other organisms. Further, large brains had to evolve to support the ability to engage in such learning. Evolutionary psychologists counter, however, that big brains are necessary simply to store the many 'cultural' rules that might be elicited by varying circumstances. How can this deadlock be broken?

It seems likely that brains are not big enough to contain all the information required by the jukebox analogy. Many of the problems that contemporary urban life throws up, for example, could not yet have been incorporated into a genetic response: such fundamental experiences as living in large groups of unrelated people are simply too novel. Evolutionary psychologists acknowledge that modern conditions are likely to spawn maladaptive responses from 'Stone Age' minds. But the fact is that modern culture on the whole seems to be highly adaptive because it has massively extended

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the niche in which humans can live, and tremendously increased the total population of our species. It seems unlikely that brain mechanisms selected when humans lived under different circumstances would lead to the adoption of behavioral traits that currently contribute so greatly to genetic fitness.

0724.005 Further, there are reasons to expect that evolution would naturally settle on social learning as an optimizing strategy for the acquisition of information relevant to changing environmental circumstances (Boyd and Richerson, 1985). So it seems reasonable to suppose that at least some of our behaviors are informed by rules acquired from other agents. Social learning should particularly be favored when the lessons from individual trial and error are expensive (either cognitively or in fitness terms), such as determining what is edible when a species can live in a variety of habitats.

0724.006 Biology therefore determines our general capacity for cultural learning and is responsible for universal abilities like language. However, cultural variations among peoples are attributable to learnt traditions and not to innate or genetic propensities. At the same time, specific psychological adaptations have probably evolved to foster the selective but accurate acquisition of rules through social learning. Language itself can be seen as such an adaptation; it generates signals that allow the reliable transmission of complex, highly contextualized rules for behavior between people.

0724.007 However, questions remain as to the nature of cultural transmission. In particular, is it like a copying process, or is it a reconstructive one? Some argue that even though cultural information must make its way from person to person in the coded form of messages, this process nevertheless results in a high-fidelity duplicate being produced in the receiver's brain – much as if it had been faxed or photocopied – thanks to evolved mechanisms for social communication. On the other hand, studies of social interactions suggest that the receiver – given the relative paucity of information that actually passes between people – must reconstruct a considerable proportion of a message's content. The nature of the process that underlies human communication has implications for the nature of human psychology. However, if reconstruction and fax-like transmission are equally reliable, then they may exhibit the same population-level dynamics.

CULTURAL SELECTION PROCESSES

Not all social messages are equally attended to or adopted by their receivers. In effect, selection among messages occurs. A selection process requires a population of entities whose frequencies increase or decrease according to their relative fitnesses. Cultural selection can be distinguished from natural selection by the kinds of units on which it operates (Cavalli-Sforza and Feldman, 1981). Just as natural selection is supposed to influence the evolutionary fate of genes, cultural selection works on the prevalence of cultural traits over time.

Cultural selection can occur at each point in the process of communicating information from one individual to another. At the source, there can be psychological selection among potential messages. Once a message has been sent into its channel, physical selection pressures can also affect the chances of that signal reaching its destination. For example, sometimes the message's code does not match well with the modality in which it is sent. Then, after the signal has been detected by the receiver, further psychological biases can exist for attending to and adopting the idea expressed by the signal. Some kinds of information acquired through social learning might not be consistent with other beliefs that an individual holds, for example, and would be rejected for that reason. Later, for further transmission to occur, performances of the related behaviors must also be motivated. Thus, certain traits are favored in effect by the social or physical circumstances in which they find themselves.

Analysts of cultural evolution must be careful to distinguish cultural selection from natural selection, since both can affect the frequency of cultural traits. Some beliefs, for example, cause people to engage in behavior that is detrimental to their health, survival or likelihood of reproducing. Belonging to a religious group that forbids engaging in sex is only the most obvious case of such an effect. In this form of natural selection, the frequency of a culturally acquired belief is reduced not by changes in belief but by the culling of hosts with such beliefs from the population. This makes cultural evolution a process of 'dual inheritance', in which cultural selection and natural selection operate in parallel or in opposition on cultural traits (Boyd and Richerson, 1985).

Where do the mechanisms of cultural selection come from? How do they in turn evolve? The values used to discriminate between incoming messages can themselves be the product of earlier

social learning, or constitute biases produced by a history of natural selection for discriminating between useful and harmful stimuli. Thus, some cultural traits can 'feather the nest' for later-arriving ones, suggesting that cultural evolution can engage in positive or negative feedback processes.

CULTURAL TRAITS

0724.012 What is the unit of analysis in studies of culture? Traits – segregating particles of culture – or cultures themselves, taken as a whole?

0724.013 Throughout its long history, anthropology has attempted to deal with the problem of identifying cultural traits. More recently, however, this attempt has largely been abandoned as impossible – and in any event unnecessary. According to this view, cultures are to be considered as unified wholes, or at least complexes, which are not necessarily divisible. Many ethnographers would argue that there is no 'atomic level' to culture, no way to uncover mutually exclusive entities with stable properties from which cultural compounds are formed. The tendency is now to describe culture as an ideal type, an artificial conglomeration of knowledge compiled from different people occupying varying social roles. However, this metaphysical Platonism – seeing culture as an integrated whole that transcends the minds of individuals – is analytically barren, since there is no contesting a representation that is built up by the imagination of the ethnographer.

0724.014 Many would say that we have no legitimate basis for postulating that cultural transmission is intrinsically particulate. There may be no discrete variant that is reliably learned from others through observation or any other form of social interaction. Categories are imposed on a blended reality. You cannot count up cultural values in people's heads like votes for political parties. Traits are 'clumps' of culture content, not well-bounded entities (Gatewood, 2000). However, if culture is learned, and by individuals one at a time, then no one learns everything; culture winds up being distributed. Since learning a culture takes place through social interactions, only parts of culture can be acquired at any given moment: in effect, there must be units of transmission. Admittedly, after acquisition, these units may become amalgamated into complex mental representations which become difficult to tease apart. Nevertheless, these units of acquired information – the equivalent of the atom in physics, the molecule in chemistry or the phoneme in linguistics – are the smallest possible meaningful unit of cultural information.

0724.015 So culture must be analyzed as a set of traits, but these need not correlate with natural categories of things in the minds of those living in that culture. At the empirical level, an important question concerns the way in which one is supposed to pick out cultural traits. Where do the division points for defining categories come from – from 'outside' (researchers) or 'inside' (from the group members themselves)? Either is possible. Traits can be just some item of cultural content that the analyst finds it convenient to label – in effect, they become ethnographic conventions. Alternatively, much hard work can be devoted to ascertaining how expert informants themselves classify things.

0724.016 Once the categories have been established, the question of how these traits are related to one another then arises. Computer scientists, who have thought hard about this problem, have come up with a variety of frameworks for representing knowledge bases, from nested hierarchies to network structures of nodes for concepts with links between them identifying kinds of relationships. What sort of representation is best? This may again be an empirical question, the answer to which depends on the analytical questions being addressed by a particular study.

0724.017 What, then, is the locus of culture? What is the culture-bearing unit? The traditional solution of simply using the classification people apply to themselves retains considerable appeal, since it has the subjective authority of the participants in the study. However, the actual group influenced by some cultural process or knowledgeable about some domain of belief or practice may vary from domain to domain. This suggests that there is a fluid boundary to the social group to be identified as sharing cultural traits. At best, one might be able to identify a network of people who tend to be linked together for a wide range of cultural traits; but in the end, no easy solution to this problem has appeared.

ARTEFACTS

0724.018 Human beings, along with many other species, engage in behaviors that significantly alter the environments in which they find themselves. This activity has been called 'niche construction' (Laland *et al.*, 2000). Its importance from an evolutionary viewpoint is that such alterations can subsequently influence the kinds of selection pressures that any species interacting with that modified feature of the environment will experience. As a result, population dynamics and the course of evolution can change. Niche construction introduces a

feedback loop between behavior and its physical products, artefacts.

0724.019 The production of artefacts requires 'technique', or knowledge and skills specific to that production process, typically acquired through social learning as well as individual practice. Technology is then the combination of artefacts and technique in a manufacturing context. A technology plus its supporting procedures and institutions, as well as environmental and sociopolitical conditions, can be considered a technological system.

0724.020 Artefacts themselves can be divided into two general classes: tools and machines. Tools such as hammers or rulers can originate as ideas which are then turned into physical objects by people (or machines) as the expression of that representation. Alternatively, the first exemplar of a tool type might be produced by accident while manipulating some object, or through modification of an existing tool. In any case, it is an object that skilled people can use to extend their physical or mental capacities. Machines, on the other hand, can be considered artefacts with multiple component parts that together perform a novel function which any of the parts, taken individually, would not be able to accomplish. Only humans produce machines, probably because the planning involved in the execution of the multistep process of machine construction is beyond the cognitive abilities of other species.

0724.021 How do such complex objects evolve? By playing an important part in cultural evolution. The existence of artifacts in the environment can have a significant influence on the course of cultural evolution, because they can constitute a store of information or a channel for information transmission between people (e.g. telephone wires). Artefacts, as transformed objects, should be distinguished from signals and tokens. A signal can be considered to be a patterned particle stream flowing through a channel. A token consists of a physical substrate with information inscribed as pattern in or on it; it is a template for the generation of signals. A signal is 'natural' if it is directly produced by the body (e.g. speech), or 'artificial' if produced by machines (e.g. laser beams or internet 'packets'). It is worth distinguishing between signals and tokens because they have different evolutionary roles: signals are short-lived, dynamic and energetic, designed for the transport of information. Tokens, on the other hand, are static and inert, because they are meant to be secure stores of information. Communicative artefacts contain a token, and hence are able to facilitate the communication of ideas. This means

that artefacts can act as signal templates because signals can, after contact with some token, exhibit a new pattern (e.g. amplitude or frequency), to reflect the fact that it now carries information about that artefact.

This kind of communication – mediated by artefacts – has many benefits over traditional face-to-face communication: people separated by distance and time can exchange information (e.g. through email); the effective population reached by a given message can be increased (e.g. through mass media); new communication channels can have novel effects on message receivers (e.g. 'spamming' in email); and greater control over the distribution of messages can be achieved (e.g. through 'gatekeepers' such as the media corporations). The net effect is that this progress in the design of more and more complex artefacts allows the information available to human groups to accumulate beyond that available to any other species (Tomasello, 1999). It is the highly constructed nature of the human niche that arguably makes our cultural adaptation unique.

MEMES, MEMETICS AND ASSOCIATED CONTROVERSIES

'Meme' is a word coined by Richard Dawkins (1976) to identify cultural traits with the ability to replicate themselves. The word has gained sufficient currency to be included in recent editions of the *Oxford English Dictionary*, where it is defined as 'an element of a culture that may be considered to be passed on by non-genetic means, especially imitation.' This reliance on imitation as a special form of social learning has proved crucial to the definition of memes, since many assert that only the relatively quick copying of instructions (not just behavior, but the directives for instigating that behavior) can support the chains of replication events necessary to sustain an evolutionary lineage, and particularly the curiously cumulative quality of human culture.

What distinguishes memetics from other evolutionary approaches to the understanding of cultural evolution (such as evolutionary psychology or sociobiology) is the insistence that what is transmitted during social learning is a replicator. Although the concept of replication is itself in need of some theoretical work, it generally is a process in which a copy is made of some source. This process must involve causation – that is, the source must be causally involved in the production of the copy (a causation condition). Second, the copy must be like

its source in relevant respects (a similarity condition). Third, the process that generates the copy must obtain the information that makes the copy similar to its source from that same source (an information transfer condition). Finally, during the process, one entity must give rise to two or more (a duplication condition).

0724.025 Thus, for a memeticist, not only are cultural traits identifiable as individualized units, but they have the power to cause their own duplication. Further, memes are cultural traits interested in preserving themselves, using individual minds as hosts. Memes, in this view, are responsible for the persistence of certain cultural traits, including those that do not directly favor the biological fitness of the group in which those traits spread themselves.

0724.026 It was originally thought that memes could encompass behaviors, artifacts or mental contents as varied as 'tunes, ideas, catch-phrases, clothes fashions, ways of making pots or building arches' (Dawkins, 1976). It seems unlikely, however, that replication could occur in a similar fashion in all of these contexts. In fact, behaviors generally do not replicate in the sense described above. It is true that one person can mimic the speech and even the accent of another, reproducing spoken phrases perfectly. Why is this not an example of cultural replication? Either because the spoken signal dies 'in the air' prior to a second signal being constructed in response by the imitator, or because the signal is converted into another form which circulates through the receiving brain before emerging again as the same spoken phrase. In either case, the signal is not duplicated; it either lives through a complex cycle of exchange between people, or a second example is produced after some lag. Thus, despite the facile appearance of a signal being replicated, behavioral mimicry does not hold up to our criteria for replication.

0724.027 Similarly, the processes through which most artifacts are produced fail the information transfer condition. For example, on the factory floor, it is seldom the case that features of one car on the assembly line are determined by reference to those same characteristics in the previous exemplar. Instead, the assembler (a person or robot) relies on instructions from a centralized database such as a computer-derived datasheet to tell it what to do next. If one agrees with the majority of memeticists that behaviours and artefacts should be eliminated from consideration, then memes are restricted to minds, where the conditions for replication may hold.

0724.028 As noted above, this means that imitation is the replication mechanism identified by memeticists. It

has even been suggested that the human ability to imitate makes the existence of memes self-evident. The argument is that if imitation is defined as the ability to copy behavior or ideas by observing them, then surely the product of that observation must be replicated information. Although transmission is a process in which information is duplicated, it does not follow that the information itself is responsible. Other factors – such as common mental mechanisms for inferring mental or cultural content from sensory stimuli – could lead to the same result. The existence of memes therefore remains unproved.

Neither is there any theoretical reason to suppose that just because culture evolves it must be founded on an independent replicator. Even though biological evolution is grounded in the replication of a biological entity (genes), this does not mean that every evolutionary process must be. In fact, evolution is a more general process than that. Why this is so requires some explanation.

The central concept in evolutionary theory, arguably, is that of a population. It is populations that evolve, and this evolution consists of shifts in the relative frequencies of various types of traits within the population. This population can consist of any collection of things. Simply divide these things up according to type. If these types have tendencies to increase or decrease in the local environment owing to the presence of instances of the same type, this is their relative fitness. If these types reproduce, that makes the process more 'biological', but it is not necessary. We only need to be able to establish objective criteria for determining what type of object something is, and ascertain it has fitness, to declare it subject to an evolutionary process. The replicator approach, however, makes additional demands – in particular, that changes in frequency result from the essential differentiating features of the type being copied from old tokens into the new ones.

Fitness, from this perspective, is just the tendency of a type to increase or decrease, given a specifiable suite of conditions in the local environment. Selection is change in the frequency of types due to their relative fitness, and variation is change in a type's frequency independent of the type's fitness. Conspicuously missing from these definitions are the notions of replication, heredity (or copying fidelity) and the ancestor–descendant relation. This implies that we can understand evolution without invoking the concepts of either an evolutionary lineage, or replicators. Neither concept is a prerequisite for evolutionary theory to be fruitfully applied to some phenomena (Harms, 1996).

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0724.032 The natural conclusion, therefore, is that culture can evolve without memes. Support for memetics must come in the form of empirical studies that identify replicators at work in cultural reproduction. Until that happens, we can remain convinced that culture evolves, despite having no firm idea about the mechanisms underlying the reappearance of cultural traits each generation.

CONCLUSION

0724.033 How people come to share similar mental contents remains an essential problem for social science to solve. Does culture provide big-brained creatures with a system of informational inheritance which operates independently of, but in parallel with, genes? Alternatively, are supposedly cultural responses induced by mental algorithms that simply reflect a cumulative history of natural selection for genetically directed behaviors? Unfortunately, it will require additional research to find a conclusive answer to this question. However, the fact that cultural change exhibits the basic characteristics of an evolutionary process – inheritance, variation and selection – seems less open to debate. Whether there will be overarching rules for describing cultural transmission processes remains to be determined, and it seems likely that who learns what from whom will turn out to be specific not only to particular groups, but also to particular periods within the life history of each group – perhaps even to each kind of trait being considered. The goal of establishing general rules of cultural transmission and selection applicable to everyone everywhere remains elusive, making the study of cultural evolution intrinsically complex.

References

- Bates DG and Plog F (1990) *Cultural Anthropology*. New York: McGraw-Hill.
- Boyd R and Richerson PJ (1985) *Culture and the Evolutionary Process*. Chicago: University of Chicago Press.
- Cavalli-Sforza LL and Feldman MW (1981) *Cultural Transmission and Evolution*. Princeton, NJ: Princeton University Press.
- Dawkins R (1976) *The Selfish Gene*. Oxford: Oxford University Press.

- Gatewood JB (2000) Reflections on the nature of cultural distributions and the units of culture problem. *Ethnology* **35**: 293–303.
- Harms W (1996) Cultural evolution and the variable phenotype. *Biology and Philosophy* **11**: 357–375.
- Laland KN, Odling-Smee J and Feldman MW (2000) Niche construction, biological evolution and cultural change. *Behavioural and Brain Sciences* **23**: 131–75.
- Tomasello M (1999) *The Cultural Origins of Human Cognition*. Cambridge, MA: Harvard University Press.
- Tooby J and Cosmides L (1992) The psychological foundations of culture. In: Barkow JH, Cosmides L and Tooby J (eds) *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*, pp. 19–136. Oxford: Oxford University Press.

Further Reading

- Aunger R, ed. (2001) *Darwinizing Culture: The Status of Memetics as a Science*. Oxford: Oxford University Press.
- Aunger R (2002) *The Electric Meme*. New York: Free Press (in press).
- Blackmore S (1999) *The Meme Machine*. Oxford: Oxford University Press.
- Durham W (1991) *Coevolution: Genes, Culture and Human Diversity*. Stanford: Stanford University Press.
- Lumsden CJ and Wilson EO (1981) *Genes, Mind and Culture*. Cambridge, MA: Harvard University Press.
- Plotkin HC (1993) *Darwin Machines and the Nature of Knowledge*. London: Penguin.

Glossary

- Artefact** A physical object modified through human-directed activity.
- Cultural trait** The smallest identifiable unit of cultural meaning.
- Cultural transmission** A process in which information is exchanged between individuals, possibly mediated by artefacts.
- Imitation** The psychological ability to learn the rules for producing a behavior through the observation of others.
- Meme** A unit of cultural information which replicates itself during social learning.
- Niche construction** The process through which behaviors that modify some aspect of the environment come to influence selection on the organisms interacting with that modification.
- Replication** A process through which information copies itself.
- Token** A physical substrate capable of storing a message, and from which signals can extract information.

Keywords: (Check)

Encyclopedia of Cognitive Science - author queries

Article 724 [Aunger]

Memes, Memetics ...

paragraph 3, sentence 2 ‘...memes are cultural traits interested in preserving themselves’ - presumably the meme itself cannot be interested; could this be reworded?

Further Reading

Aunger 2002; have moved this from the reference section as it has not yet been published. Or has it? Please update as appropriate.