Defining and explaining culture

(comments on Richerson and Boyd, *Not by genes alone*)

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Abstract: We argue that there is a continuum of cases without any demarcation between more individual and more cultural information, and that therefore "culture" should be viewed as a property that human mental representations and practices exhibit to a varying degree rather than as a type or a subclass of these representations and practices (or of "information"). We discuss the relative role of preservative and constructive processes in transmission. We suggest a revision of Richerson and Boyd's classification of the forces of cultural evolution.

There is much to admire in the work of Robert Boyd and Peter Richerson, and much that we agree with. In particular we share the goal of developing a "population thinking" approach to cultural evolution that sees it neither as a mere extension of biological evolution (as in pop sociobiology), nor as a mere analog of biological evolution (as in pop memetics). *Not by genes alone* (Richerson and Boyd 2005) provides a good overview of their contribution, and an appropriate target for discussion. Here we focus on general issues linked to their very definition of culture.[1]

What is culture?

What is at issue is not a matter of conceptual analysis, let alone of terminology, it is a matter of explanatory adequacy. True, cultural anthropology gets by without any clear and agreed upon definition of culture, but then the goals of most anthropologists—and their more obvious achievements—are ethnographical and interpretive rather than theoretical. When the goal is to develop a naturalistic and theoretical approach, one's definition, or at least one's characterization of culture matters.

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[1] Richerson and Boyd discuss some of the ideas of Sperber 1996 and underscore points of agreement and disagreement. We believe that much of the disagreement is only apparent and due to a misconstrual of Sperber's exact view (for which, given his own past miscontruals of Boyd and Richerson's views, Sperber bears a good part of the responsibility). In Claidière and Sperber (submitted), we discuss a genuine point of disagreement reagarding the role of attraction in cultural evolution.

Richerson and Boyd write:

> *Culture is information capable of affecting individuals' behavior that they acquire from other members of their species through teaching, imitation, and other forms of social transmission.*
> By *information*, we mean any kind of mental state, conscious or not, that is acquired or modified by social learning, and affects behavior. (p.5 – their italics)

Information is an abstract relational property. It is not something that, in and of itself, has causes or effects. Rather, it is a property that material items may possess in virtue of their causal connections. For instance, tree rings contain information about the age of a tree in virtue of being caused by seasonal changes in tree growth. The brain state that realizes my perception of a computer screen in front of me contains the information that there is a computer screen in front of me in virtue of being caused, through appropriate perceptual processes, by the computer screen in front of me. The picture of Madonna on the computer screen contains information about Madonna's face in virtue of having been caused (via a complex causal route before reaching this screen) by light reflected from Madonna's face. Unlike tree rings, perceptions and pictures not only contain information, but *have the function* of making the information they contain available to information-using systems (to other brain mechanisms in the case of perceptions, and to people in the case of pictures). The information contained in items that have such a function is indicative not only of their past history but also of their likely future effects. Whereas, with very few exceptions, tree rings have no causal effects, pictures of Madonna cause perceptions that cause recognitions that cause various actions such as imitating her hairstyle or buying her CDs.

So, in spite of its abstract character, information can be relevant to identifying the past and future causal relationships of items—e.g. genes, brain states, or pictures—that contain it. Still, the causal powers of these items depend on their material properties, not just on the information these material properties implement. The same information, say about Madonna's face, displayed on a computer screen, stored in an electronic file at www.madonna.com, or printed on a CD jacket, has, in each of its implementations, different effects, in particular a different cultural impact. To understand how information is distributed, one must understand how it is implemented.

Cultural information spreads across members of a population through their interactions, that is, through their producing, in their common environment, events and objects that carry

information that others can pick up. So, is cultural information located in people's mind/brain or in their behaviors and artifacts, or in both? On this question, Richerson and Boyd might seem to waver. In the citation above, they define culture as information, and information as mental states. Later on they qualify this mentalistic approach, stating that "culture is (mostly) information in brains" and noting that "undoubtedly, some cultural information is stored in artifacts" (p.61). Later still, discussing the example of the bowline knot, they note "If we could look inside people's heads, we might find out that different individuals have different mental representations of a bowline, even when they tie it exactly the same way" (p.64). This might suggest, contrary to what Richerson and Boyd want, that the cultural items in this case are the knots themselves, rather than their variable mental representations.

Mental representations are, we agree, of special importance to culture, since the very existence of culture presupposes a population capable of mental representations—no mind, no culture—, while there is no well-defined type of behavior or of artifact that is a necessary ingredient of culture. Still, we see no good reason to deny that behavior and artifacts through which cultural information is transmitted are cultural too. Against such a point of view, Dawkins and other memeticists have argued that, in fact, mental aspects of culture are to behavioral and artifactual aspects what genes are to their phenotypical expressions (Dawkins 1976, 1982). However, in the absence of anything resembling a cultural germline, and in the presence, rather, of a systematic back-and-forth, in the causal chains of culture, between mind-internal and mind-external episodes, there is no more reason to consider that, say, tokens of the competence involved in tying a bowline knot beget other tokens of the same competence by producing actual bowline knots for other to see than to consider that token bowline knots beget other token bowline knots by recruiting people's cognitive and motor capacities.

Richerson and Boyd do not argue for their definition of culture as located (mostly) in mental representations by invoking a spurious analogy with the genotype/phenotype distinction. Their approach to cultural evolution, particularly manifest in their more formal models and simulations (that are evoked but not discussed in this book), gives them, we surmise, a different rationale to consider that culture consists in mental representations. For them, the most basic type of micro-event in cultural evolution is the adoption by an individual of some cultural variant. The state of a culture at a given moment corresponds to the distribution of variants resulting from these micro-events, and the evolution of culture is that of this distribution. Richerson and Boyd are particularly interested in the way in which the

adoption of a variant by some individuals may cause others to adopt it too. With such a focus, the role played by behaviors and artifacts in cultural transmission, even if indispensable, is less central than the role played by individual decisions. Richerson and Boyd take the collective phenomenon of culture to be the evolving outcome of the aggregation of these decisions (with random and biological factors interfering in various ways). They are more interested in the relatively simple psychology of decision—even if, unlike many methodological individualists, they don't see it as a mere implementation of rational choice theory—than in the necessarily more complex psychology of the formation of mental contents.

Richerson and Boyd would, no doubt, be the first to acknowledge that such an approach is based on a simplification of the cultural process. Moreover, their book is full of insightful qualifications and nuances correcting this simplification. Nevertheless, they would argue—and rightfully so—, without extreme simplification, no useful modeling or simulation is possible.

The kind of simplification of the cultural process that Richerson and Boyd opt for has proved quite fruitful in their work. Still, we want to suggest, it would be a mistake to assume that this particular simplification zeroes in on the defining properties of culture and abstracts away only from relatively peripheral or less important properties.

In their discussion of the forces of cultural evolution, Richerson and Boyd distinguish three major types: random forces, natural selection, and "decision-making forces." This third type, specific to cultural evolution, is itself divided in two sub-types: "guided variation" and "biased transmission." Biased transmission in turn has three sub categories: "content-based bias," "frequency-based bias," and "model-based bias" Much of Richerson and Boyd's most valuable work has been devoted to exploring the consequences of these two last types of biases. Frequency-based and model-based biases have to do with the choice of one cultural variant over others, and can reasonably be described as "decision-making forces." "Guided variation" and "content-based bias" on the other hand do not belong to the psychology of decision, even broadly understood.

Here is a simple example of "guided variation." Imagine a foreign stew recipe being introduced with some success in a population. Cooks however make mostly unconscious and idiosyncratic decisions regarding the proportion of the ingredients and hardly ever reproduce the model. These modified stews don't depart at random from the original recipe; rather, they gravitate towards a new recipe more in the style of the local cuisine. Over time, this new

recipe becomes the one people have in mind and on their plate. To model such a plausible evolution one should take into account not only frequency of adoption but also rate and directionality of the variations that occur in the actions of cooks.

Here is a simple example of "content-based bias." Imagine a comedian telling two new jokes one evening on a television show. Both jokes are much appreciated and adopted by the same number of viewers for future retellings. However joke 2 is harder to remember than joke 1, so that, say, 80% of the people who adopt it forget in less than a month, whereas only 20% forget joke 1 in the same period. Quite plausibly, joke 1 will spread and become a standard joke in the culture, and joke 2 won't. To model such a plausible evolution one should take into account not only frequency of adoption but also frequency of forgetting.

Our disagreement with Richerson and Boyd is about the character and role of processes such as content-based bias and guided transmission. Their picture, as we understand it, is that most of cultural transmission consists in the choice, by individuals, of some cultural variant among those on offer. Chosen cultural variants are acquired through learning processes (imitation in particular) that are essentially preservative. Even if they need not result in strict replication, they preserve across episodes of transmission the informational content of a variant sufficiently well for it to be socially shared and hence cultural (with frequency and model-based biases contributing to the effectiveness of the process). In the case of "content-based bias" (e.g. some jokes being better remembered than others), further psychological processes alter the probability of a specific variant being effectively implemented in people's mind as a function of its content. Such content-based biases don't modify the contents of cultural variants: they affect only their frequency. So, even if they are not strictly speaking decision processes, Richerson and Boyd can see their effect as similar to that of decision proper: in the end some variants are more often retained than others. The only constructive process involved in cultural evolution, that is the only process capable of introducing new contents in a non-random way (as in the example of the evolving stew recipe) is, according to Richerson and Boyd, guided variation.

Preservation and construction in cultural transmission

We, on the other hand, believe (and have argued at length elsewhere, e.g. Sperber 1996, Sperber & Hirschfeld 2004, Sperber and Claidière forthcoming) that psychological mechanisms involved in social learning always involves a combination of preservative and constructive processes. All learning (with the possible exception of rote learning of nonsense

material) is biased by content. What this means however is not just that some input-content is more easily and therefore more often learned than some other. It also means that, when an input-content is neither too hard nor maximally easy to learn, it is likely to be transformed in the direction of greater ease. For instance a foreign word is remembered with a normalized phonology; a story is remembered without its irrelevant details; a novel idea is remembered as just a version of an already familiar one; the recipe of an original stew is remembered so as better to fit the cook's mental habits, and so forth. If so, there is no clear distinction between content-based bias and guided variation.

Content-based biases often result in non-random variations, and guided variation is often guided by content-biases. It might seem that guided variation, being most important as a source of innovation, cannot, in this, be guided by content-based biases. In fact, applying a content-based bias to novel material (e.g. a local cuisine bias to a foreign recipe), or approaching familiar material with a content-based bias other than the most obvious one (e.g. approaching an algebraic problem with a geometric bias) can result in innovation.

Given this, we would suggest a different classification of what Richerson and Boyd call "decision-making forces." To begin, we would rename the whole category *psychological forces* since we believe the exclusive focus on decision is misleading. Among psychological forces, we would distinguish *source-based biases* and *content-based biases*. Source-based biases affect the probability that a given content be adopted depending on the source(s) from which it is received. Both Richerson and Boyd's frequency-based and model-based biases are examples of source-based biases. Content-based biases are effects of the cognitive mechanisms that construct a mental representation on the basis of informational input. We believe that most if not all of these cognitive mechanisms are domain-specific and treat different contents differently (Hirschfeld & Gelman 1994). The construction of a mental representation involves greater or lesser transformation of the input information, with two limiting case, that of total loss of information or complete forgetting when cognitive mechanisms just ignore or filter out the input information, and that of the construction of a mental representation containing exactly the same information as the input, as when you correctly remember a phone number. Most processing of input information results neither in total loss nor in exact copy; it is, as we insisted, both preservative and constructive.

Incidentally (since we won't pursue the matter here), beside random forces, natural selection, and what we prefer to call psychological forces, we would suggest adding a fourth category: *ecological forces* that act on the behaviors and artifacts involved in the causal

chains of culture. What may cause a stew recipe to evolve is the local availability of ingredients and possible substitutes. Higher population density with the increased availability of the expertise of others buttresses folk-knowledge, protects it from the risk of drift, and allows it to complexify. Hard-to-remember narratives nevertheless reach a cultural level of distribution when writing provides an external memory. Complex calculus is much more commonly performed and has a greater cultural impact when it can be handled by computers, and so on. Just as psychological forces involve mental mechanisms that are in part genetically determined and in part the output of culturally informed cognitive development, ecological forces involve aspects of the environment that are themselves the result of human action, and therefore of human culture (a point interestingly discussed under the label "niche-construction" by Odling-Smee, Laland et al. 2003). Richerson and Boyd are of course well aware of these ecological factors and give many examples, but they don't give them a place among the different kinds of force they identify.

The information contained in the behaviors and artifacts through which culture is transmitted is quite generally insufficient to determine by itself the contents of the corresponding mental representations. In order to exploit this information, learners must bring to bear on it not only general learning or imitation skills, but also domain-specific information and procedures already present in their minds. In other terms, we believe that Chomsky's poverty of the stimulus argument generalizes, mutadis mutandis, from language acquisition to all forms of cultural learning. The learning process involves not just extraction but also interpretation of input information, and interpretation typically involves enrichment of the information interpreted.

One might object: if preservation of information were not secured to a high degree by general preservative mechanisms such as imitation or communication, how could any informational content ever end up being shared in a population to a degree sufficient to determine an identifiable cultural item? Isn't the very existence of culture proof that there are mechanisms of information preservation effective enough to secure its relative stability? We reply: the burden of securing population-scale content stability does not have to be wholly carried by preservative processes. Richerson and Boyd themselves show how frequency and model-based biases can, at a population scale, help compensate for the insufficiencies of individual preservation processes. We agree, and suggest that constructive processes are also a major factor of population-scale stability, since these processes tend, across individuals, to interpret input information in a common direction. In the case of language acquisition, for

instance, assuming that there is an evolved language acquisition device helps explain how children of the same language community end up having very similar mental grammars when the linguistic evidence on the basis of which these grammars are acquired consist in the quite different set of utterances heard by each child over the learning years. In cultural transmission, the limits of preservative processes are, we claim, to a crucial extent compensated by the convergence of constructive processes.

What Richerson and Boyd say about bowline knots is likely to be quite commonly the case: people's mental representation of cultural information is likely to possess an important degree of individual variation. Provided that these variation gravitate towards the same "attractors" (Sperber 1996) in the space of possibilities (for instance towards the same phonological regularities in word learning or towards the same balance of tastes in a stew recipe), these variations need not compromise cultural stability. Of course, not all mental representations of cultural contents exhibit the same level of individual idiosyncrasy. The mentally represented phonology of words for instance is likely to exhibit much less individual variation than their mentally represented semantics. However, even when learners produce in each of their individual minds a quasi-exact counterpart of a cultural model, it would be a mistake to assume that they do so by actually copying the model in all its relevant details. Learners can achieve what looks like strict reproduction when in fact the input information is incomplete and ambiguous, provided that their constructive abilities converge towards the same specific outcomes.

More importantly, thanks both to source-base biases and to converging constructive processes, there can be variations at every step—mental or environmental—in the causal chains that distribute cultural information without compromising the population-scale stability of this information. Let us underscore, especially for those who accept a gene-meme analogy, that these variations are quite different from phenotypic variations that play no role in the mechanics of genes replication. In the transmission process we are describing, learners do not acquire true cultural information by ignoring idiosyncratic aspects of the input and extracting and copying only its cultural core, but by interpreting the information as provided by means of constructive mechanisms they share with one another.

If we are right, cultural contents owe much of their stability to the directionality of constructive psychological processes. These processes are typically complex, domain-specific, and therefore much better at stabilizing some contents than others. Richerson and Boyd themselves give excellent example of the type of processes we have in mind in

discussing, for instance, the evolution of word phonology. But then, simplifying cultural evolution by focusing almost exclusively on decision processes, while it has, in their modelling work, proved remarkably insightful, may also suggest a distorted view of the general character of culture.

"Culture" or "cultural"?

So let us suggest another way of defining or at least characterizing what is cultural—"what is cultural" rather than "what is culture" because, as we shall argue, culture is better viewed as a property rather than as a thing.

In non-human animals, relatively little information if any is acquired by social learning. Humans on the other hand owe much of their information to others. Many criss-crossing causal chains distribute a great amount of information throughout any human population, and, as rightly stressed by Richerson and Boyd, this information accumulates. Still, even among humans, most mental representations play an ephemeral role in just one individual's mind and are not transmitted at all. Many causal chains distributing information are short: the information is about local and transient situations, e.g. children's need, where to find food, gossip about relatives, and does not flow beyond its narrow perimeter of relevance. Some information travels further and last longer, for instance a rumor in a village, a restaurant becoming fashionable in a neighborhood. Other information still, e.g. general knowledge, technical skills or religious myths, does propagate over wider social space and for a longer time and may even become prevalent in a whole population for generations.

When anthropologists and others talk of culture—independently of the way they might define it—, they refer to this widely distributed information and to the mental representations, behaviors, artifacts, and institutions that, one way or another, implement this information. Richerson and Boyd's definition of culture as "information capable of affecting individuals' behavior that they acquire from other members of their species" does not mention the scale of the distribution and would be satisfied, for instance by the micro-local information John acquires from Helen when she says, "Careful, the coffee is hot!". Still, it is clear that they mean by "culture" widely distributed beliefs, norms and skills, and not such ephemeral trivia. What we want to stress, however, is that there is a continuum of cases between these and widely distributed information. Throughout this continuum, most mental representations and behaviors are shaped by a mix of individual and social inputs, so that there is no way to pry apart cultural information from all the information found in a human population.

At the most individual end of the spectrum, we find mental representations that are not communicated and behaviors that are not addressed to others. Still, an individual uncommunicated thoughts, plans, or even dreams are typically built with ingredients—concepts, pieces of knowledge, or of know-how—that were socially acquired. Moreover, even if not communicated to others, these idiosyncratic mental representations do contribute to shaping behavior and, as a result, something of their tenor seeps through into the causal chains of social communication. I may not tell my dreams, but they may inspire my choice of metaphors. I may neither explain nor even demonstrate my way of preparing a stew, but my stews themselves carry information about my methods.

At the other, more cultural end of the continuum, there is still often much idiosyncrasy in mind or in behavior. It is easy to find culturally stable behaviors or artifacts, ritual behaviors and their paraphernalia for instance, but their very cultural success has much to do with the fact that they can be mentally interpreted with a high degree of idiosyncrasy (Sperber 1975). It is also easy to find deeply entrenched cultural attitudes and ideas, such as the notion that some other ethnic group is inferior to one's own. Such prejudices often survive even when their explicit expression is discouraged. In such cases, quite diverse implicit public manifestations, each adjusted to some micro-local interaction, may suffice to secure the wide and lasting distribution of these attitudes.

We are not denying that there are many cases where quasi-identical mental representations and quasi-identical behaviors propagate by causing each other in turns, for instance children counting rhymes, or calligraphic skills. Still, it would be not just a simplification, but also a serious distortion to take such "memish" cases as paradigm examples of the cultural process.

If we are right and there is a continuum of cases without any demarcation among humans between more individual and more cultural information, then "culture" is better viewed as a property that human mental representations and practices exhibit to a varying degree than as a type or a subclass of these representations and practices (or of "information"). To explain culture so understood, the object of study must be the overall flow of information among humans, through its mental and public implementations; the question that must be answered is what causes some of causal chains to extend more than others in time and space and to stabilize better than others the contents they vehiculate. For this, the study of culture must be embedded in a more general epidemiology of representations and practices that attends —as does medical epidemiology—to the complexities of both individual and ecological

mechanisms. Boyd and Richerson's work over the years is, of course, a major contribution to such an epidemiology.

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