The role of categorization as a way of fidelity preservation in cultural transmission

El papel de la categorización como medio de preservación de la fidelidad en la transmisión cultural

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Abstract

This paper deals with the problem of identifying cultural replicators and providing a plausible replication model for culture. Depending on what kind of information is considered to be replicated, the different evolutionary models of cultural transmission are clustered into three main groups which are referred to as externalism, internalism and multi-substratism. From these, internalism is argued to be the most plausible position, but it fails in explaining how cultural information can be faithfully replicated in our species despite essentially depending on individual processes of intentional inference. It is concluded that no author seems to have fittingly adopted a categorization model stemmed from a usage-based perspective, and such a model would entail a feedback dynamic in category formation which could allow for an a posteriori purification of the input information flow. This way, categorization would partially equate the role of DNA in genetic transmission cycles.

Palabras clave
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Abstract

En este artículo se aborda la problemática de la identificación de los replicadores culturales y la elaboración de un modelo de replicación cultural verosímil. De acuerdo con el tipo de información que se supone objeto de replicación agrupamos los diversos modelos evolutivos de transmisión cultural en tres grandes categorías, que denominamos externalismo, internalismo y polisustratismo. De ellas, argumentamos por qué, a nuestro juicio, el internalismo es la opción más adecuada; si bien los modelos internalistas no suelen dar cuenta satisfactoriamente de cómo la información cultural puede haber alcanzado un cierto grado de fidelidad en la transmisión pese a depender de procesos individuales de inferencia intencional. Concluimos que ningún autor parece haber adoptado un modelo adecuado de categorización fundamentado en una perspectiva basada en el uso. Tal modelo implicaría una dinámica de retroalimentación en la formación de las categorías que podría permitir la depuración a posteriori del flujo de información entrante.

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Introduction

Traditionally, most scientists and researchers have considered culture a phenomenon independent of biological evolution, admitting possible analogies, such as those that can be easily noticed between natural evolution and the evolutionary processes of culture and language, as a kind of metaphor of purely explanatory value (Croft, 2013b). Moreover, the general conception of culture as a reality that is contrary to biology — the famous dualism of nature vs. culture — reflects an understandable point of view in a species so deeply cultural as mankind; but perhaps that dualism is simply not a suit-

able background to approach the scientific analysis of the phenomenon of culture. In its most basic aspects, human culture is a reality shared with other animal species (Boesch, 2011), and the unique features it adopts in our species should not conceal that. Essentially, we are certainly facing a social transmission process of information by means of replication, even if those special features become important and transcendental because they virtually put our species ahead of others. Hence, if we want to delve into the explanation of human originality as a cultural species, we should inherently examine the way cultural transmission occurs, which involves firstly, identifying the replicated information, and, secondly, trying to plausibly describe how that replication takes place. In this paper, we will contribute by giving some answers to those questions through analyzing the different ideas on the matter and finally trying to draw some conclusions from them.

The identification of cultural replicators

The identification of the informational basis of culture was a development mainly by the well-known biologist Richard Dawkins, although he certainly had many past influences from various fields, being particularly influenced by Claude Shannon's theory of information. Since then, it became common to regard cultural transmission as a process of information replication. However, there was no consensus, and the disagreements affected some essential matters, for example, the mere identification of material substrates where cultural information should be looked for. Because of the novelty of the evolutionary approach to the areas of culture and language, on account of its rootedness in biology — taking also into account the relative distancing of that procedure from traditional perspectives — it is no surprise that scholars located in this area had begun by considering to become as object of study all possible sides or ontological manifestations of cultural phenomena: the psychological, the behavioral, and the material. The reason for this is that those manifestations were reckoned at first by scientists as diverse stages of the "lifecycle" of the flows of cultural information, which essentially include replication, variation and interaction-selection phases. And this is just what occurs with the information transmitted by genetic means. Consequently, at the moment of coining the term 'meme', in his book *The Selfish Gene*, Dawkins adopted a broad perspective that closely resembles the well-known seminal definition of culture issued a century before by the anthropologist Edward B. Tylor[1], including within the concept all kinds of cultural manifestations: "Examples of memes are tunes, ideas, catch-phrases, clothes fashions, ways of making pots or of building arches" (Dawkins,

[1] "Culture or civilization, taken in its wide ethnographic sense, is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society" (Tylor, 1871/2012, p. 1).

1976/2006, p. 192). In any case, it seems possible to perceive a revealing parallel between the two authors as for their pioneering role and the syncretic nature of their viewpoints.

From a little more rigorous standpoint, it is also possible to find a multifaceted position in the proposal of language change analysis made by the linguist William Croft (2000). Croft owns a functional-cognitive, usage-based training, and this background entails recognizing a key role to the deferred imitation of behaviors; but also develops the concept of 'lingueme' (derived from meme) to account for the linguistic structures present in the utterances when regarded as observable material entities — samples of 'parole' in the Saussurean sense — calling 'lingueme pool' the interactional set formed by all products or outcomes, even if ephemeral[2], from the various linguistic behaviors that occur in a speech community. Indeed, Croft explicitly defends the usefulness of completing the analysis of the cognitive processes applied on the memory instantiations of linguistic behaviors with the study and analysis of the very external manifestations of the phenomenon:

> A significant split in functionalism is between those who are more cognitively oriented, focusing their attention on cognitive explanations, and those who are more discourse oriented. These two functionalist approaches have largely gone their own ways, developing models of language meaning (cognitive linguists) and language in use (the discourse functionalists) However, there are some functionalists such as T. Givón and W. Chafe whose work draws on both cognitive and discourse models. Usage-based models integrate cognition and discourse, in that there is a feedback relationship between the mental representation of linguistic knowledge and language use. The two approaches are inherently compatible: language must be understood from both a psychological and a social-interactional perspective. (Croft, 2015, p. 474)

Other authors have moved even more forward in the process of externalization of cultural replicators. Wiliam Benzon (1996), for example, adopted a sheer materialistic position by placing them exclusively in the physical world, and assuming their psychological projection, concepts, as a secondary and derived product. In his view, as he points out, there is a reversal of the spontaneous identification that arises by analogy between the role of concepts in the cultural domain and the function of the genotype in the biological world. Concepts, as he points out, would be more similar to phenotypes, because of features like inconsistency or variability. After all, if cultural replication ultimately depends on imitation, as claimed by many authors (e.g. Blackmore, 1999; 2007; Dawkins, 1976/2006; Tomasello, Kruger & Ratner, 1993), the entity to be

[2] Croft, as other authors, considers the sounds from the linguistic use as material entities, as he states in Croft (2013a).

replicated should supposedly consist of an external and observable entity. On his behalf, Derek Gatherer (1998) makes similar statements, pragmatically alluding to the supposed impenetrability of culture to researchers if studied as a psychological reality. Those arguments perfectly resemble the externalist approaches from anthropology or linguistics.

However, to place replicators as external entities also faces many problems. Artifacts and behaviors satisfy the condition of being observable entities, and, therefore, replicable; but they cannot replicate themselves without the intermediation of a human brain that is able to conduct the process of imitation. In fact, the very idea of imitation suggests an unequivocally psychological process. A surface imitation based only on behaviors would lead either to mimesis or to emulation (Tomasello et al., 1993), which constitute "externalized" forms of imitation that can only act as mud foundations for a cumulative evolutionary process, as is also remembered by Robert Aunger:

> The difficulty with this position is that complex culture, and the kind of rapid cultural accumulation seen in humans simply can't be based on behaviour-copying; if it was enough to watch each other's behaviour and then mimic it, then chimpanzees and other species would have developed cumulative culture. (2007, pp. 601-2)

On the other hand, although concepts can be instantiated on neuronal structures which can differ in every individual (Müller, 2009)[3], and they even represent no more than ad hoc cognitive interpretations of external phenomena (take into account, for example, linguistic reanalysis, a kind of emulation), the extra-psychological world still exhibits much more variability in relation to the concepts themselves. In that sense, think, for example, about the very wide range of social, situational and idiolectal realizations that an only phoneme can materialize when uttered in the linguistic use. In view of all those reasons, a few years later after his first definition of cultural transmission units, Richard Dawkins himself deemed it is appropriate to restrict the concept of meme to the psychological realm:

> A meme should be regarded as a unit of information residing in a brain [...] It has a definite structure, realized in whatever medium the brain uses for storing information [...] This is to distinguish it from phenotypic effects, which are its consequences in the outside world. (Dawkins, 1982/1999, p. 109)

[3] But cf. Alexander Huth, Wendy de Heer, Thomas Griffiths, Frédéric Theunissen & Jack L. Galant (2016). This recent work seems to have found an intersubjective strong correlation between many brain areas and the kind of information stored in them by individuals, at least in the range of the same cultural community.

This view was supported with some different nuances by many other authors. Furthermore, it is possible to differentiate between those who restrict replication to a psychological dimension, without explicitly explaining how memes are able to jump from one brain to another — or even denying memes could do this as such memes (See Aunger, 2002) — and those other scholars who in one way or another recognize artifacts and behaviors which participate in memetic replication (including linguistic utterances), as a kind of 'para-memes'. Within the discipline's literature these latter authors are often called 'externalists' as well, and their approach superficially resembles that of the socio-semiotic trends from anthropology and linguistics, which in turn comes from the Émile Durkheim's idealized conception of 'social facts'. This is on account of the potentiality they seem to attribute to the material dimension of cultural manifestations, in this case as replicators; even if these authors also tend to give priority to the psychological dimension of culture, recognizing at most that culture's external or "phenotypic" manifestation retains some attributes from the corresponding psychological dimension and this fact is not indifferent for replication. The problem with this formulation, however, is that it carries an implicit multi-substratist dimension that appears to transform culture into a form capable of ontologically becoming to being in various substrates. This multi-substratism would appear to establish cultural phenomena as entities able to transcend biology, rather than being biological phenomena themselves. A very often cited example of this claim is the following fragment from the philosopher Daniel Dennett:

> Genes are invisible; they are carried by gene vehicles (organisms) in which they tend to produce characteristic effects [...] Memes are also invisible, and are carried by meme vehicles - pictures, books, sayings (in particular languages, oral or written, on paper or magnetically encoded, etc.) Tools and buildings and other inventions are also meme vehicles. A wagon with spoked wheels carries not only grain or freight from place to place; it carries the brilliant idea of a wagon with spoked wheels *from mind to mind*. A meme's existence depends on a physical embodiment in some medium. (Dennett, 1995, pp. 347-8, Emphasis added)

In a later quote, Dawkins gave a new refinement of his idea of meme, confirming it as a mental reality that is also capable of materializing onto different kinds of substrates, playing both the role of storing and transmitting systems:

> The new replicators are not DNA and they are not clay crystals. They are patterns of information that can thrive only in brains or the artificially manufactured products of brains — books, computers, and so on. But, given that brains, books and computers exist, these new replicators, which I called memes to distinguish them from genes, can propagate themselves from brain

> to brain, from brain to book, from book to brain, from brain to computer, from computer to computer. (Dawkins, 1986/1996, pp. 157-8)

From this perspective, the transmission of cultural information — memetic replication — would be characterized by exhibiting a biphasic lifecycle, unlike the recognized semi-cyclical nature of biological replication, where information is exclusively transmitted across the germline[4] (McCrohon, 2012; see figure 1). This peculiarity would seem to condemn culture to Lamarckism, as its inheritance mechanisms would incorporate all kind of interferences coming from the interaction of culture with all the information present in the environment.

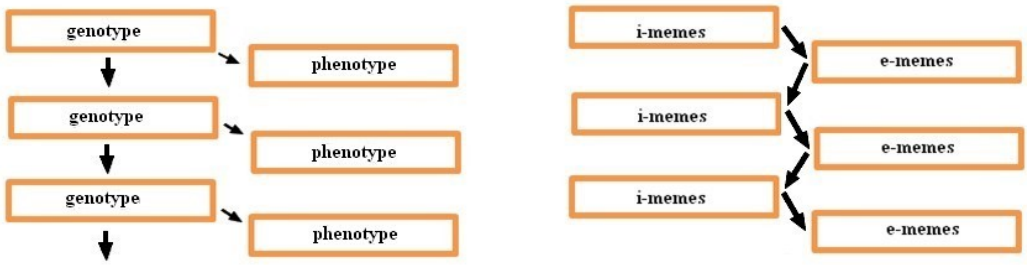

Figure 1. Lyfecycles in genetic and cultural lineages
Source: Adapted from Luke McCrohon (2012). [5]

However, the multi-substratist nature of memes is denied by those who can be fittingly called internalists, as is the case of Robert Aunger, Dan Sperber or Nikolaeus Ritt. Those authors show a kind of mentalism which exclusively places memes and their replication as "states of neural matter" (Aunger, 2002), that is to say, manifestations of synaptic connections between neurons:

> If memes could exist in brains, in speech and in artifacts, they would be the superheroes of the replicator world, able to transform themselves into any shape or form at will, like the Proteus of Greek mythology. Instead, memes must be confined to one physical substrate, just as their brethren, the biological replicators genes and prions, are. I thus argue that only one substrate can be associated with memes. (Aunger, 2006, p. 92)

Therefore, those authors discard the possible existence of memes floating as such memes in artifacts, as in the wagon of the upper Dennett's example. Dan Sperber and Nicolas Claidière (2008), for instance, as this author also does, classify those examples

[4] It is referred to as germline the transgenerational transmission line formed by those information units which are actually replicated. In the case of biological organisms, the germline would basically consist of the information contained in the genotype.

[5] McCrohon calls *i-memes* memes as a psychological reality, and he calls *e-memes* their external manifestation as behaviors or artifacts.

of cultural inference by reverse engineering within the range of individual information acquisition, or individual learning:

> 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 (...) The learning process involves not just extraction but also interpretation of input information, and interpretation typically involves enrichment of the information interpreted. (Sperber & Claidière, 2008, p. 6)

Excluding artifacts and behaviors from memetic replication saves us from what Aunger himself (2002, p. 241) had called "the ghost of Jean-Baptiste Lamarck". However, it poses a problem for explaining the ultimate source of the information which is being replicated. In a similar way, Ritt also speculates in the linguistic domain about a possible material basis for memes, formed by Hebbian neural assemblies:

> How are we to think, then, of the internal structures that a brain develops as it acquires linguistic competence, and what are the chances that two brains which direct their speaker's linguistic behaviour in similar ways and produce texts with similar structures should themselves be isomorphic? In order to deal with that issue let us first elaborate the idea that information is implemented in brains in the form of neural constituents and the connections among them. (Ritt, 2004, p. 162)

Although it could be possible to reckon certain nuances, it does not seem difficult to perceive some resemblance between those models and mentalist positions from the areas of anthropology or linguistics, even from the generative grammar. The reason is that all of them seem to regard the external dimension of psychological processes as a kind of their depleted epiphenomenon. This perspective involves a self-contained nature for replication dynamics which could be identified, up to a certain point, with the DNA's environmental encapsulation and isolation. For instance, Aunger (2002) reckons memetic transmission between brains as mediated by *signals* (certain actions and artifacts) which could be figured out as a kind of phenotypic manifestation of memes, but devoid of any of their attributes. Signals would this way become simple replication "instigators". That is, the replicated information would stay beforehand in the own brain. Not coincidentally, both Aunger and Sperber adopt and extend Noam Chomsky (1980)'s poverty of stimulus argument to the whole cultural domain.

However, Dawkins and most authors who adopt a more abstract viewpoint tackle the problem of multi-substratism just by only deducting from the meme concept any material bond or manifestation. This is not inherently incompatible with internalism, but could also match a kind of idealism similar to that of the socio-semiotic trends:

> When we say that all biologists nowadays believe in Darwin's theory, we don't mean that every biologist has, graven in his brain, an identical copy of the exact words of Charles Darwin himself [...] Yet, in spite of all this, there is something, some essence of Darwinism, which is present in every individual who understands the theory. If this were not so, then almost any statement of two people agreeing with each other would be meaningless [...] The meme of Darwin's theory is therefore that essential basis of the idea which is held in common by all brains that understand the theory. The differences in the ways that people represent the theory are then, by definition, not part of the meme. (Dawkins, 1976/2006, p. 196)

In other words, according to this view, culture (memes) would be likely to be conceived as ideal or abstract entities, but they could materialize in various ways within the domain represented by each unique brain. It is not difficult, as Maria Kronfeldner does, to draw a parallel between this supposed memetic adaptability to the peculiarities of the environment and what biologists call phenotypic plasticity, that is, the variability that the genotype experiences in its phenotypic expression in accordance with environmental conditions, the so-called epigenotype (Kronfeldner, 2007). The essential difference, recognized by Kronfeldner, has to do with the fact that the genotypic basis would really have a more or less clear and stable material substrate. This would be the DNA:

> If memes are analogous to genes, and if there is something (i.e., the interpretation of the meme) that changes from context to context, whereas the meme stays the same, then memes have a context-dependent phenotypic 'expression.' Now, the following interpretational problem arises: Do they also have a material realization in a 'meme-DNA', which is invariant across contexts? If there is no such context-independent material realization of the essential Darwinism-meme, then this means that memes do not have a DNA, as genes have a DNA that stays the same in different organisms, despite different phenotypic realizations. Thus is the meme a purely abstract entity without a clear material identification? (Kronfeldner, 2007, pp. 104-5)

The encapsulation of genes in the DNA as means of isolation from environmental interaction, however, perhaps should not be an obstacle to recognize the difference between the genetic information itself and what DNA represents as its material foundation. Regardless the confusion made by many authors, it seems obvious that informa-

tion and matter are ontologically different entities, as it is well explained by George C. Williams, involving that the mono-substratism of genes could be more a contingency than an ontological requirement:

> Evolutionary biologists have failed to realize that they work with two more or less incommensurable domains: that of information and that of matter (...) You can speak of galaxies and particles of dust in the same terms, because they both have mass and charge and length and width. You can't do that with information and matter. Information doesn't have mass or charge or length in millimeters. Likewise, matter doesn't have bytes. You can't measure so much gold in so many bytes. It doesn't have redundancy, or fidelity, or any of the other descriptors we apply to information. This dearth of shared descriptors makes matter and information two separate domains of existence, which have to be discussed separately, in their own terms.
>
> The gene is a package of information, not an object. The pattern of base pairs in a DNA molecule specifies the gene. But the DNA molecule is the medium, it's not the message. Maintaining this distinction between the medium and the message is absolutely indispensable to clarity of thought about evolution. (Williams, 1995, pp. 42-43)

As a matter of fact, the implicit philosophy upheld by the genocentric program commenced by Dawkins in *The Selfish Gene* entails that replicators, by definition, can be conceived as pervasive and independent from their material instantiation. Replicators would be 'immortal' in Dawkins' words, and within the realm of biology that aspect would provide a quite convincing (even if controversial) explanation to characteristics as dispensability of most of the genotype, biological altruism, etc.

> Genes are potentially immortal, while bodies and all other higher units are temporary. (Dawkins, 1976/2006, p. 40)
>
> We must not forget that, at least in modern bodies like our own, the cells are a clone. All contain the same genes [...] Genes in each cell type are directly benefiting their own copies in the minority of cells specialized for reproduction, the cells of the immortal germ line. (Dawkins, 1976/2006. p. 258)

This quote proves great significance because in the biological world genes stay encapsulated in a single substrate, and internalists advocate that memes stay restrained to neural networks. Conceding that, we should also keep in mind that the rationale of the very existence of replicators would bring about that we are actually facing copies of genes or memes, rather than genes or memes themselves. These memes would make up abstract entities which would stay relatively safe from the private fate achieved by each of their material instantiations. Of course, instead of this idealism,

we might prefer, as Aunger puts it, simply devise a kind of extreme solidarity among replicators from the same lineage, among entities that "sacrifice" or do not mind disappearing if that favors the survival and propagation of their informational clones. It is not difficult to figure out that such altruism could consist of an inheritable feature, a feature promoted by selective forces acting over the replicators; but this view also seems to claim the existence of some kind of extra-spatial and timeless connection between such units just so they can act this way.

However, the idea of memes being able to instantiate on all types of substrates, exhibiting themselves as such memes not only in our minds but also in cultural behaviors and artifacts, not only looks rather bizarre and would require, in any case, "brains" capable of interpreting them in order to exist as such extra-psychologic informational entities; such a view also seems to clearly contradict some deductions that can be drawn from an in-depth analysis of cultural information exchange processes. In particular, it seems that we can completely discard the idea of culture moving into packets or material wrappings from one brain to another, as if those packets were like seeds carrying all the genes that would generate a new plant. In particular, if we regard cultural transmission from a linguistic level, for example, it becomes clear that the entire meaning, and especially the pragmatic meaning, does not "migrate" within the message transmitted in communicative acts. This clarification, which seems to contradict assumptions of many linguists trained in traditional semiotic traditions, was noted both by externalist and internalist authors, then rising as a clear obstacle to multi-substratism, at least to most common multi-substratist conceptions:

> The speaker's intended meaning stays inside the speaker's head. The listener constructs his or her own meaning according to his or her own perceptual and conceptual resources. In many cases these two meanings are congruent, especially in routine and relatively simple matters. There are, however, many cases where the two meanings ARE NOT congruent. (Benzon, 2013, p. 40)

> The problem is that no 'piece of language' that 'actually occurs' occurs completely specified at all levels of structure, if one thinks of it as an external, material, and easily observable manifestation of language (…) the textual products of utterances 'receive' their structures only in interaction with speaker's minds. 'Their' structures are not really 'theirs' at all, but mental constructs which they trigger in highly complex ways […], and it is even more obviously true with regard to meaning: recall that one and the same physical pattern of sounds or graphics may convey utterly different senses to different speakers. (Ritt, 2004, p. 158)

In other words, behaviors and cultural products, if objectively regarded from an external point of view, make up entities with an informational potential much simpler than the memes they were generated by, or the memes that we assume are able to generate in another brain. Somehow, there seems to exist a broad consensus as to their intermediary role in the replication processes, but the idea that behaviors or artifacts can be entities akin to memes and, therefore, genuine cultural or linguistic forms with the added advantage of being easily observable and analyzable, does not seem to be tenable. Rather, they could be "instigators", as suggested by Aunger. Croft, for example, saw himself forced to recognize such a deficiency after Ritt's comments:

> Ritt is right to say that the meaning conveyed in an utterance is generally taken to be part of the linguistic structure, especially so among linguists including myself who treat grammar as symbolic: a pairing of grammatical form and its meaning. It thus seems that for most linguistic replicators, they must combine linguistic form, which is external at least in part, and meaning, which is conceptual. (Croft, 2013a, p. 19)

Faced with this scenario, Croft then decides to look for support in the developmental systems theory (Griffiths & Gray, 1994; Oyama, 2000), a movement that resembles an ultimate attempt to save his multi-substratist approach. Developmental systems theory (DST) is an alternative formulation from the domain of biology which highlights the importance of environmental interaction and the epigenetic processes of development, integrating them into a replication dynamic by adopting a holistic view. From this view, the complete lifecycle of biological entities is regarded as a complex unit. That, obviously, involves contesting the semi-cyclical nature of genetic inheritance. In the context of biology, DST is reckoned as an anti-reductionist approach radically opposed to the genocentric perspective. This theory regards genetic information as only a part of the set of information intergenerationally transmitted across organisms' lineages. When applied to culture, this position would put on display the apparent advantage of suppressing the difference of fidelity between culture and the broad biological model, because in both cases, interaction with environmental information would play a renowned role. Moreover, this theory would bring about a leading role to behaviors and artifacts. But, if the functionality of cultural transmission is to be considered, the DST is more a methodological trap than a valid scientific explanation. Instead of explaining how human culture exhibits cumulative evolution without owning a germline, it appears that Croft simply intends to overshadow the germline's role in genetic transmission.

By way of example, we can try to figure out what the germline represents for fidelity by comparing two different processes to make a copy of a song and playing it

on a stereo system. In the first case, we would make the copy by directly duplicating the information contained in a CD. This process would be roughly analogous to the transmission of genetic information across the germline. In the second case, we would copy the song by means of a digital recorder while it is being played and, afterwards, we would play it in our own stereo. Inevitably, in the second case the copy's quality should be lower, as it would include interference from the environmental information, and the original source of the song's information would continue to deteriorate with every recording.

The view provided by the DST would lead to an attempt of integrating the data from the playing of the song in the definition of its replication processes, so that we would take into consideration aspects like the environmental conditions during the song's playing, the technical features of the stereo system, the characteristics of the recorder, etc. This way, the replicated information would not be only that of the original CD but also the information coming from the whole set of the song's interactions with the environment, as that information would be incorporated during the playing in any of the two cases. If, for instance, the stereo system's technical conditions were adequate, this would motivate an entire procedure that will repeat, with new song copies which would tend to be played on similar devices. So, each "lifecycle" would encompass both the song's copy and the song's playing, and the replicated information — the "replicator" — would then equate to the whole lifecycle, including both the original song's information and the information originating from its environmental interactions, irrespective of the copy procedure we could have used.

That wide perspective on the phenomenon to be analyzed could, however, still be a complementary methodological option which maybe can be assigned some usefulness to, but it doesn't generally represent a rebuttal of traditional standpoints (See e.g. Shea, 2011). In the present matter of contention, which is the study of cultural replication, the methodological distancing that Croft proposes to adopt would involve envisaging cultural replicators as the entire lifecycles of cultural acts:

> Cultural replicators can best be thought of as life cycles of cultural acts, from human intention to their manifestation as behavior (and artifacts) to its social effect. This solves the conundrum of what counts as a cultural replicator. It requires one to accept that replication can be quite indirect, but there appears to be no alternative in cultural evolution. (Croft, 2013b, pp. 99-100)

This approach would seem to have the advantage of explicitly recognizing the multifaceted and complex nature of cultural transmission. It does not void, however, the obvious differences with respect to the genetic transmission processes. In this author's opinion, it does not solve the puzzle of cultural replicators. In the previous

metaphorical example, using the combination of the copied song accompanied by the particularities of the playing as a unit of analysis did not prevent the live record from being affected by environmental interference that could have been avoided by making a copy directly from the CD. If we wish to explain how culture can hold a cumulative process of evolution despite allegedly relying on a replication model founded on a biphasic lifecycle, we suggest another approach must be adopted, and different from that of proposed by Croft.

Apprehension of psychological predispositions as a guarantee of fidelity in cultural transmission

According to Tomasello et al. (1993), the main difference between human cultural replication and the replication of other advanced species would have to do, essentially, with the ability to include in imitation not only a mental representation of the watched behavior, but also a minimally faithful replica of the mental processes which have triggered the behavior, on the basis of intentional inference. In fact, imitation can even come about without an immediate performance of the observed behavior (Courage & Howe, 2002; Piaget, 1945/1976), which offers the additional advantage of allowing a deferred contrast and analysis of the incorporated information. This process would be critical, for instance, during the phase of initial mother language acquisition:

> Infants and toddlers carefully observe the behavior of others around them. These experiences are represented in long-term memory and subsequently affect the child's own productions. Evidently, recall memory and generalization are capacities normally-developing infants bring to the table in language acquisition, and they would seem to be vital to the job. (Meltzoff, 1999, p. 259)

The increasing depth of the imitation process would present as an outcome an exponential increase of transmission fidelity, and that would result in the materialization of a cumulative evolutionary mechanism which is often referred to by experts as a 'ratchet effect' (Tomasello, 2000; Tomasello et al., 1993). By means of this effect, the advantage provided by imitated behaviors lessens the risk of becoming lost during succeeding replication processes, and arising innovations will ever start from the experience already accumulated within the social group. This improvement avoids the requisite of individually repeating all the steps and procedures carried out by previous generations to acquire the corresponding knowledge (See Bandura, 1977).

Therefore, the essential factor that could provide an explanation for human uniqueness would come from our capacity for including sufficiently faithful representations of imitated people's mental processes in our cultural learning procedures. In order to achieve this goal, at a given time, and probably in a gradual manner, it came into existence a special collaboration of the own imitated individuals, who would have inserted, as a kind of clue, additional behaviors in social contact situations. This clue would mostly consist on coordination devices, such as gestures and what is often known as linguistic use, acting simply as assistance for intentional inference (*vid.* Croft, 2013b). The discernment of intention, that is, the ability to figure out the sender's purposes, is the actual foundation of communication, once language, as it is widely recognized today, does not function as a full meaning code (Grice, 1957; Wilson & Sperber, 1984). Nevertheless, categorical and abstract, paradigmatic meanings recalled by linguistic use without a doubt make up an indispensable support if we want to yield a minimally accurate estimation of the psychological processes of another individual, at least when they exhibit a modicum of complexity. By including the use of language in everyday social contact situations, very likely an exponential rising in the amount of cultural transmission fidelity became possible (Donald, 2005), and, somehow, that would have allowed the linkage of people's brains in the social group, and the connection with their ancestors' knowledge, forming a unified cognitive system which vastly outshines the cognitive capacities of all other species, as exposed by Daniel Dennett (1995).

Despite that, cultural replication continues to be founded on inferential procedures, that is, on assumptions about the psychological processes of other people; and the optimal functioning of linguistic activity as a support for revealing senders' mental states, besides requiring a conventionalized system of signifiers, demands a previous sharing of mental representations, carried out with sufficiently similar molds as to avoid transmission indeterminacy. Language certainly promotes a coordination of thought that makes possible that the replication process can be actually based on a correspondence with the information present in the sender's mind, and it performs that role with an acceptable degree of accuracy, at least for the intended purposes; but for language being able to act like this, it is still required on the social level a previous development of imitation processes which allow for a homogeneous association between linguistic behaviors and the various situational agents and aspects. That is, language seems to provide some fidelity to cultural transmission, at least with the required accuracy as to establish the foundations for an elementary culture based on a recurrent accumulation of experiences; but it is still necessary to explain how the required fidelity for linguistic acquisition itself not to widely sliding into mimesis or emulation is reached. Mimesis and emulation consist of imperfect stages of imitation,

typified by replication being unable to correctly include the psychological grounds of the replicated behaviors (Tomasello et al., 1993).

From encapsulation strategy to purification strategy

In Pérez-Rodríguez (2015), it was expounded the reason why, from this author's perspective, cultural transmission is basically inserted into the very acts of individual learning. That is to say, cultural transmission is included into the perception and categorization processes which are carried out when engendering representations and mental models. It was stated that those processes are made up of an "enriched" or "interpretative" apprehension conducted by data coming from previous experiences which remain stored in the long-term memory. Such a proposal, which is in harmony with most current approaches in psychology (See Murphy, 2004), allows unification under a unique paradigm of the diverse replication processes based both in direct and deferred imitation. It encompasses aspects like cultural transmission supplemented by linguistic apparatus (based on intentional inference), cultural acquisition from artifacts by 'reverse engineering', or "externalized" mimetic replication (the act of copying a behavior but assigning it a different conceptual foundation). In all these situations, the analysis of the perceived reality would take place by contrasting it with previous mental models stored in memory. In other words: this position would stay close to what previously has been called "internalism".

This hypothesis was initially formulated by Pérez-Rodríguez (2014b) for the possible hierarchical structure of the mental representations coming from written language expression. In more general terms, the hypothesis involves that the set of categories used in analyzing input stimuli sequences by analogical ascription arises from an intersectional juxtaposition of the diverse representations of previous experiences in the episodic memory. In other words, it consists of a typical usage-based perspective which brings about a continuous feedback between the analysis of perceived information and the modular storing of the information included in long-term memory. That is congruent with modern categorization models originating from the so-called fuzzy logic, such as Douglas Medin & Marguerite Shaffer (1978), and, particularly, Gregory L. Murphy (2004).

However, that process is founded on individual learning, and some kind of inter-individual projection should be assured in order to permit the transmission of social culture, as this is the type of culture that allows developing cooperative behaviors, and, primarily, allows the potentially boundless cumulative cultural evolution we can find in human societies. In whatever way, it must be conceded that culture in our

species without that social dimension, at least as we know it, definitively would have not been possible. The problem is that a simple intersection or contrast of mental representations coming from the subject's experiences and living situations would not necessarily provide a solid foundation for allowing cultural transmission among individuals. The diverse situations each one is exposed to in everyday life, even if unique and unrepeatable, tend to display many common or similar components; but even within the same social and environmental arena, at every particular cultural community, we can expect that every person will not undergo totally analogous experiences. Every individual's collection of mental representations would stay endlessly evolving and, thereafter, the categories concerned by each new experience would gradually be redefined, so that any new added exemplar would have the potentiality of introducing modifications into the category's prototypical image. The first time somebody would stumble a somewhat heterodox reality as, for example, a penguin, he would begin to broaden the conceptualization structure of the category 'bird', and so on. It consists of a continuous feedback process which is typical, for example, in usage-based linguistic approaches:

> The major idea behind exemplar theory is that the matching process has an effect on the representations themselves; new tokens of experience are not decoded and then discarded, but rather they impact memory representations. (Bybee, 2006, p. 716)

Predictable asymmetries in the conceptualization processes, that is, in the way people split representations of reality, are usual among the different linguistic communities, as it is already well known, but those asymmetries do not usually represent a serious restraint within the same speech community. From this perspective, the main underlying cause for such a convergence has to do with the role of language, an articulated code whose combinatorial potentiality allows humans inserting specific behavioral sequences (chunks of speech) among the rest of the sender's behaviors, acting as a kind of book index. This is just what was proposed in Pérez-Rodríguez (2015). The conventional character of those linguistic-based, specific behaviors, when associated in a more or less bijective way to the rest of categories emerged from the contrast of experiences, promotes the trans-situational homogeneity of categories, at the same time that it provides an efficient way of recalling them taking away the small inter-individual differences remaining in the conceptualization. Traditional linguists are precisely accustomed to say that each language's expressions delimit or "trim" meaning in particular and given way.

Interestingly, those categorization and conceptualization processes we account for, whose development and structuration exhibits an individual dimension, even if

conducted and homogenized by the linguistic use, represent a kind of digitalization imposed over the more or less continuous information stream coming from the environment. The digitalization process had been initially proposed by Dawkins (1999), and was later explained by Ritt (2004) using examples from the phonological domain. Both authors seem especially interested on highlighting the discontinuous or discrete nature of cultural information, unlike perspectives as that of Robert Boyd and Peter J. Richerson (1985), who deny that segments like memes can be identified within the input stream. But still more interesting is that throughout the processes of reality categorization befalls a unification of similar items in a common basis:

> A bit of speech may express a phoneme more or less clearly: it may contain anything from the most prototypical representative of the phoneme to nothing at all, or even a sound which may at other times stand for a different phoneme. When the sound is processed mentally all those shades of grey are lost. (Ritt, 2004, p. 203)

In other words, tokens are checked against types and replaced by them; but in the course of that process, the types are concurrently being redefined by the influence of tokens. Hence, there is an existing feedback dynamic that Ritt seems to be unaware of. From a more general perspective, it can be said that different versions of the observed experiences and behaviors become contrasted and unified under prototypical or ideal forms when they are replicated as abstract, situational schemes, thus setting aside particular aspects. And this procedure is just an approach to what could be an inverse dynamic to that of the so-called genetic expression, where genes are transformed into phenotypes that lay open to environmental interaction.

If we turn back to the previous analogy on the song; we will see that the song's copies made by means of a recording device would incorporate environmental interference which could end up undermining the song's transmission line. Culture, as was previously described, inevitably displays such an apparent implausible operating mode. However, in a situation we had no access to the CD with the original version, we always have the option of contrasting the different 'live' recorded versions, so that we could restore something which is more similar to the original song from those recordings. We could repeat the same procedure after each recording phase, always ameliorating the copies by previous contrasting versions, so that the greater number of versions, the deeper the degree of fidelity reached in replication. That would consist of a collation process comparable to what is used by textual critics to set old texts into their canonical form from the corresponding preserved versions. This way, we would be a posteriori creating something similar to what the germline symbolizes for genes' lineages. In other words, fidelity in cultural transmission would be reached by a purifi-

cation strategy (the token > type replacement) instead of an encapsulating strategy. The relevance of the frequency factor (the number of involved tokens) brings that concept close to Luke McCrohon's "incremental" replication. That author, though, did not take into consideration of aspects like the influence of categorization processes on the dynamics of information purifying:

> Copying fidelity of most i-memes based on a single exposure to an associated e-meme is incredibly low, so low that based on it alone, positive adaptations would be at constant risk of being swamped by mutations. High fidelity single exposure copying is however not necessary; so long as multiple exposures can be expected before a learner is likely to create a significant number of e-meme copies, high fidelity incremental replication is sufficient. (McCrohon, 2012, p. 161)

Clearly, what we are proposing stands for an always uncompleted 'canonicity' for memes, an existence "by approaching" an abstract ideal (in the sense indicated by Kronfeldner) which perhaps does not exist; and it is obvious that such a process is not able to ensure an absolute identity as a result of the replication phase. It would lack any functional value out of the domain of each speech community. However, such a process is already enough for allowing the kind of cumulative evolution that is distinctive of complex culture. After all, it does not seem imprudent to expect that the fidelity degree of information transmitted in replication acts could depend on the form that information interacts with the environment. If the environment exhibits a high entropy level, replicators must contain a good amount of very accurate instructions; at least in case they are intended to originate a complex entity, as for example a biological organism. Any slight deviation from the established standards could engender a non-viable phenotype. However, if the environment already holds a high degree of syntropy; if, for instance, it consists of a mental structure envisaged as a system or polysystem of oppositions which are organized as ideal stages of discontinuous distributions of input stimuli representations (See Pérez-Rodríguez, 2014b); then, a smaller number of instructions, or a relative variability in defining each instruction, could still be useful for the purposes of cultural transmission. In this case, a stimuli's categorial ascription would be made easier by the oppositional structure of representations, so that an ideal stage could be attained in which it becomes possible to prevent most of the variability that gets incorporated in memetic lineages in the course of their replication processes. That stage would be reached by contrasting and combining perceived information with existing (previously acquired) information. That would be especially typical from adult or experienced individuals, who had been able to accumulate a meaningful repository of experiences, and it would be both valid regarding linguistic replication and any other cultural domain. From an external point of view, it is thus

possible to speculate that a continual accumulation of ever more accurate, subsequent versions of a given cultural pattern could return the capacity for performing the corresponding behaviors in an ever more perfect manner.

Therefore, cultural replication keeps being viable because of it being based on concepts which reflect abstract categories, and because those categories experience a continuous redefinition and "purification" dynamic, homogenized up to a certain point by the intersectional role of linguistic usage across most of the situations every individual experiences within one's community. Accordingly, the definitive value of each category comes from its position within a more or less socially shared system (see the concept of 'value' in Saussurean semiology). "Purification", as we call it, is taken for granted in categorization processes, and it can be regarded as a correction mechanism which can be added to the rest of selective factors influencing cultural selection. This way, the degree of fidelity that cannot initially be preserved by cultural transmission because of environmental interference, could be accomplished by implementing a stricter selection regime, in line with Kim Sterelny, Kelly Smith and Michael Dickison's proposal:

> Copy fidelity is relevant to evolutionary concerns. But there is no fidelity threshold that all replicators must meet. For there is a relationship between fidelity and the strength of selection. If copying is very error ridden, and selection is weak, then noise can swamp selection, and cumulative selection will be unable to build complexly adapted interactors. But stronger selective regimes can drive evolution in less perfect replication regimes. (Sterelny, Smith & Dickison, 1996, pp. 391-2)

However, Ritt, who also admits in his own way the incremental nature of cultural replication, refers to this issue by presenting it as purpose-driven process. That position, from this author's perspective, represents just another way for stating that the memetic interactional environment is much less entropic than the environment of biological entities:

> Error correction, or 'normalisation', in memetic replication works so well not merely because it involves discrete units (which may be very likely), but also because it is goal-driven, and may approach its target gradually, and in repeated trials. The copying of cognitive instructions appears therefore to be not strictly speaking self-normalising at all. It rather appears to be normalised by the purposes the instructions are supposed to serve. (Ritt, 2004, p. 206)

In any case, both factors, environmental complexity (most of the required information for cultural transmission can be found a priori in the receiver himself) and

'digitalization' (categorization and conceptualization) of input information, concur for the increasing fidelity. Still, the main difference between this work's proposal and other possible forms of internalism is that the source of environmental complexity of memetic replication structures does not only come from the subject's phenotypic frame (the brain machinery), but especially from the role performed by the specific configurations created by the progressive, continuous, and modular information stock formed from previous experiences. From a usage-based perspective, it is possible to conceive the role played by cultural information in configuring its own interaction and replication environment as a feedback dynamic that can be properly identified with niche construction processes from the biological realm. The concept of 'niche construction', which would ultimately entail the very participation of memes in the purification process of the information stream, has already been successfully imported and adapted in other cases to the linguistic range (e.g. Altmann, Whichard & Motter, 2013), or to the cultural range (Laland & O'Brien, 2011). [6] In this case, adopting a typical Dawkinsian meme's eye view, it is proposed to consider — as an alternative and not exclusive perspective — that memes would be able to build their niche in the mind, forming our systematic cultural repertoires in a way which can be paralleled to what some biological organisms are able to do within their respective ecosystems.

Conclusions

Throughout this work, it has been exposed how language is able to ensure a basic level of fidelity to cultural transmission by facilitating the inference of intention which takes place in the individual acts of information acquisition from the external environment. The access to the psychological structures of the individuals being imitated, even by inferential methods, is an essential step to reach an imitation fidelity able to ensure the preservation in the social group of all kind of information which had proven its fitness for engendering beneficial behaviors. The cooperative nature which characterizes human societies (Wilson, 2012) — which is no doubt instinctively rooted (Tomasello, 2014) — just at some moment in our evolutionary path turned people being imitated into "senders". This is something which must have taken place when senders started to produce certain external signals with the aim of providing the receivers some cues of their own mental states. Probably, those signals could have eventually become into the linguistic use (see figure 2).

[6] From this author's view, unlike conjectured by Kevin Laland and Michael O'Brien, there exists no conflict between recognizing memes' capacity for modulating their interactional environment, and adopting a memocentric perspective.

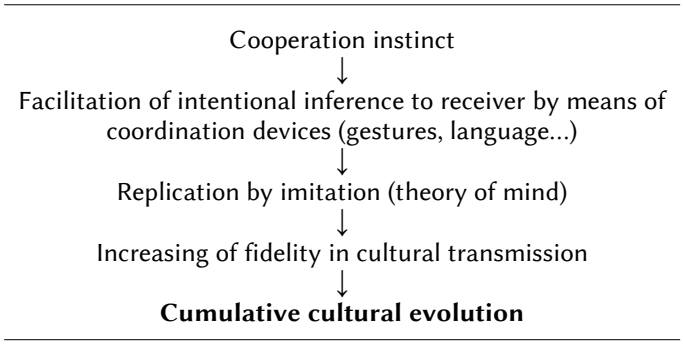

Figure 2. Possible chain of events that can have triggered human cultural evolution

As for the specific linguistic behavior, the amount of fidelity required to ensure its role in cultural transmission also depends on the same inferential processes. The foundations of the so-called linguistic acquisition basically consist of the assimilation of arbitrary associations between mental representations of particular linguistic behaviors and representations of the corresponding components and situational processes playing the role of referents — the traditionally referred to as signs and linguistic structures. At this stage, categorization processes perform their function by allowing a kind of digitalization of the input information, and that "digitalization" takes place by checking input information against the psychological structures formed from the continuous dynamics of contrast and analysis carried out over the exemplars — mental models of previous experiences — situated in the long-term memory. Those psychological structures correspond to what is more specifically known as 'mental lexicon' in linguistics. Hence, that would be ultimately the procedure which would eventually ensure language and culture the required degree of fidelity to reach the "ratchet effect" or, in other words, the capacity for transmitting accurately and maintaining in the social group what is positive of cultural adaptations. By analyzing and categorizing the information coming from the individual's experiences, its intrinsic variability gets neutralized by means of a confrontation with the already existent categories, so that it takes place a process of information "purification", which would play a role partially equivalent to that of a performance by the germline in genetic transmission chains. Within that process, the continuous stream of perceived information would come to be replaced by the discrete values established in the corresponding analogous categories, so that from "digitalization" an 'internal' code of a symbolic nature would certainly emerge — as proposed by Merlin Donald (2005).

However, the characteristic, differential use frequency of linguistic units, which indirectly derives from the configurations particularly adopted by the external context (See Pérez-Rodríguez, 2014a), and the important role played by the amount of exem-

plars employed to demarcate each category, suggest that the transmission fidelity attained by this procedure could also be closely related to the involved items' use frequency. Hence, more frequent items could end up being transmitted with greater fidelity as well. For instance, in the linguistic domain it becomes manifest that extensively used units offer a greater resistance to linguistic change (Bybee, 2006). And within the general realm of culture it seems also very likely that less usual behaviors, or behaviors novel to learners, could show a bigger trend to low fidelity replication (by mimesis or emulation) in line with Luke McCrohon's statements.

Regardless, the utilization of language and categorization processes as an ad hoc correction on the input information stream which comes from the outer environment will probably not suffice to entirely neutralize its characteristic indeterminacy. This is a byproduct of the intrinsic inferential nature of imitation. Therefore, it is likely that there is a limit in regarding the kind of cultural evolution that, for example, an illiterate society is capable to reach. The invention and spreading of writing skill must have represented another milestone in the search of greater transmission fidelity, and the same can be asserted of technological improvements like printing, standardization of scientific communication, formal education, audiovisual media, etc. Geoffrey Hodgson & Thorbjørn Knudsen (2010) even offer a list of "informational transitions" based on this kind of achievements. Incidentally, it does not seem senseless bearing in mind as a possibility a close cause-effect relationship between the degree of fidelity that a society is able to reach in cultural transmission and the corresponding sophistication of its culturally conditioned behaviors.

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