

# The cultural approach to language evolution

## A comprehensive and critical evaluation of viewing language as a cultural product

B. R. (Bjorn) Lichtenberg

RMA Linguistics, Utrecht University, Utrecht.

Manuscript written during his BA Linguistics, Utrecht University, Utrecht.

---

### KEYWORDS

Cultural evolution  
language  
innate linguistic knowledge  
transmission  
biological evolution of language

### ABSTRACT

This paper contains a critical evaluation of the cultural approach to language evolution, which regards language as a cultural product and posits that language has evolved and has its current shape due to cultural evolution. Firstly, a general introduction to the approach is given and several reasons are presented for why language evolution theories within the cultural approach do not normally acknowledge the existence of language-specific innate knowledge. Next, research on the cultural approach will be under discussion and it will be shown that several aspects of the cultural approach can be endorsed using different sorts of experimental and theoretical methodologies. Finally, on the basis of a key paper on the approach opposing the cultural approach, which will be called the biological approach, several key criticisms to the cultural approach will be given. It will be shown how these counterarguments have been rebutted and how arguments in favor of the biological approach are rejected by proponents of the cultural approach. The paper will be closed by concluding that accounts within the cultural approach can present neat explanations for several aspects of the emergence and subsequent evolution of language, among which are the emergence of compositionality in language and the conventionalization of linguistic elements.

---

### 1. Introduction

Two of the most fundamental questions in the study of natural languages are 1) what (evolutionary) processes have taken place allowing humans to have and use human language and 2) how human languages came to have the complexity they are known for. Two approaches can be distinguished with respect to the way these questions are sought to be answered: the biological approach, according to which language developed due to genetic changes, and the cultural approach, stating that language is a cultural product that has developed the way it has due to cultural transmission (Steels, 2011).<sup>1</sup> In the present paper, a comprehensive and critical evaluation of the cultural approach will be provided. Before turning to

---

<sup>1</sup> It should be noted that this distinction is more gradual than it is categorical (Steels, 2011) – any theory about the evolution of language can take a position with characteristics of both the cultural and the biological approach. For example, there can exist considerable diversity concerning the take on aspects such as innateness, acquisition and rate of evolution. This paper describes the cornerstones associated with the two endpoints of this continuum.

the discussion at hand, I will start by shortly introducing the cultural approach, as this is the main focus of the paper, as well as the biological approach, because it will be made reference to passingly throughout the paper and will be crucial in the discussion of the way the two approaches relate to one another.

The cornerstones of the biological approach can be ranged within biolinguistics, a linguistic subfield of which Lenneberg (1967) was one of the first advocates and which is concerned with discovering and researching the biological fundaments of human language (Boeckx, 2013). According to this approach, language has biological roots and was allowed to develop due to a genetic altering enabling our brains to store, process and produce language. As of yet it is unclear what this genetic altering held exactly, but there is agreement on the thesis that language is unique to humans and what makes language unique is encoded in our genotype. As will be discussed, a common standpoint within this view is that there is innate knowledge specific to the mental faculty of language which constrains the shape of human languages and is employed by the language-acquiring child.

The present paper, however, will not focus on the biological approach as much but rather on the view opposing it, which regards language as a result of constant cultural transmission and will therefore be termed the *cultural approach*. According to this view, language is a communication system that got more and more accustomed to the human brain. Language acquisition is viewed as an instance of cultural transmission: children imitate the communication system they hear around them and if necessary, alter the language according to what is easiest for them to learn and remember. For reasons that will be discussed later, this way of defining and identifying language does not allow for our genetic system to adapt to it; most scholars arguing in favor of this view therefore deny the existence of language-specific innate knowledge.

This paper is structured as follows. In section 2, an objective overview of the cultural approach to language evolution will be given. Section 3 discusses research on the cultural approach generally, to get an idea of the ways language is altered by means of transmission and the methodologies most commonly employed in cultural evolution research. Section 4 provides a critical discussion of the cultural approach, in which the biological approach plays a major role. Section 5 closes the paper with some concluding remarks.

## 2 Language as a cultural product

### 2.1 Cultural evolution and the cultural approach to the evolution of language

A general and conventional way of describing the term *culture* is by defining it as the information that people acquire via “social transmission mechanisms such as imitation, teaching, or language” (Mesoudi, 2011, p. 2-3). Cultural knowledge is not encoded in genes or DNA but is represented by neural structures (Danchin, Giraldeau, Valone, & Wagner, 2004; Mesoudi, 2011). Importantly, culture is defined not in terms of behaviors but in terms of the knowledge underlying and bring-

ing about those behaviors (Mesoudi, 2011). The term *cultural evolution* implies that cultural knowledge can, in fact, evolve in a way which is similar to genetic, Darwinian evolution, which is characterized by “selection for desirable characteristics” (King & Jukes, 1969, p. 788), and it has in fact been attested that the two share a lot of fundamental properties; for example, they can both be triggered by selectional pressure (Danchin et al., 2004; Mesoudi, Whiten, & Laland, 2006). Combining the terms *culture* and *evolution* therefore results in a term referring to the process of change of socially transmitted knowledge resulting in a more advantageous position for the species to which the change occurred. The cultural approach to language thus states that language is a product which is transmitted socially and knowledge of which is essentially neurological in nature rather than genetic.<sup>2</sup>

Importantly, the cultural approach views language acquisition as an instance of cultural transmission: language, being a cultural product, is transmitted from adult users to the child. For instance, Chater and Christiansen (2010) posit that language is an example of so-called *C-induction*, an aspect of human development triggered by the need to coordinate with other members of the society: “[in C-induction,] the aim is to do as the others do” (Chater & Christiansen, 2010, p. 1138). According to these authors, it is not important which rules are used within a community, as long as the rules children acquire are the same as those adhered to by the other members of it.

Cultural evolution occurs for several reasons. One important reason for cultural change to happen is for reasons of integration – that is, if a certain cultural trait A can be better integrated into the already existing set of traits than a trait B contained in this set, trait A is likely to come to replace trait B over evolutionary time (Bruner, 1956). This means that a trait is likely to develop if it follows more logically from knowledge already acquired, that is, if it is easier to learn. Since I have posited culture to involve neural structures representing cultural knowledge, it can be concluded that a reason for cultural change to happen is in the case there is an alternative at hand which is easier for neural structures to adapt to. If language is viewed as a product of cultural change, one is thus driven to assume that language has adapted to the brain and not the other way around (as is assumed by adherents of the biological approach). This position is, indeed, explicitly taken by, for example, Chater and Christiansen (2010).

## 2.2 The cultural approach and domain-specificity

As indicated by the literature discussed below, most scholars adhering to the cultural approach do not deem the existence of language-specific learning mechanisms or language-specific innate knowledge plausible. I will now continue to

---

<sup>2</sup> It should be noted that cultural approach is not a commonly used term but a term that I chose to use to refer to approaches to language evolution sharing part of their core ideology. This core ideology to theories within the cultural approach consists in their assumption that language has its current shape due to cultural evolution.

present some of the arguments that have been raised within the paradigm of the cultural approach supporting this assumption.

Firstly, it has been argued (Chater & Christiansen, 2010; Christiansen & Chater, 2008) that the cultural evolution of language happens too fast for genetic, biological systems to adapt to: linguistic structure and learnability can be highly improved within ten generations (Kirby, Cornish, & Smith, 2008; Verhoef, 2012), while the substitution of one gene takes around 150 years (Ohta, 1972) and the evolution of a trait often involves the substitution of multiple genes. Language constitutes, therefore, a “moving target” (Chater & Christiansen, 2010, p. 1134) for our genetic system: by the time our genetic system has adapted to language, the language has already changed such that this genetic adaptation will not be of any use or might even be a burden in language acquisition.

Secondly, Christiansen and Chater (2008) argue that it is unlikely that the same linguistic characteristics have arisen in communities which do not experience top-down pressure to converge on the shape of their languages: how could linguistic universals arise when linguistic communities are in no contact with other communities? And if linguistic universals could not have arisen, how could language-specific innate knowledge have?

Thirdly, it has been posited that biological adaption “is driven by the constraints of the immediate environment” (Christiansen & Chater, 2008, p. 495). Therefore, biological adaptation to language would be unlikely with respect to linguistic aspects that are not superficially visible. Since languages are highly diverse at the surface level, linguistic constraints cannot be operative at this level but need to apply to the underlying levels comprising aspects such as syntactic hierarchy. However, biological adaptation does not normally happen to such abstract properties.

Finally, as noted by Smith and Kirby (2008), cultural evolution is a more powerful mechanism than commonly assumed and cultural change is able to account for the complexity of human languages to such a degree that there is not much left for genetics to explain. This will be further elaborated on in section 3.<sup>3</sup>

### 3 Agent-based and more recent methodologies within cultural evolution research

After having discussed the cultural approach in a general fashion, in this section, I will look into the research that has been conducted concerning the external va-

<sup>3</sup> It should be noted that the cultural approach does not exclude the possibility of the existence of innate mechanisms that are employed in, for example, the use and/or acquisition of language; it merely excludes the possibility of these mechanisms to have developed specifically for language. Innate knowledge is, according to the cultural approach, domain-general and for that reason innate knowledge has to take the shape of abstract principles that remain constant independently of cultural change and moreover are relevant for more cognitive functions than only language.

lidity of the cultural approach. The purpose of this discussion is twofold: 1) to get an idea of the way cultural transmission is implemented in practice and 2) to get an idea of the methodologies that can be employed when conducting research on cultural evolution and transmission. To this end, I will discuss research endorsing the cultural approach in general.

An experiment by Kirby et al. (2008), which involved a so-called *diffusion chain*, was one of the first to investigate cultural evolution with human participants. Previous experiments concerning the cultural evolution of language made use of “computational simulations and robotic experiments” (Steels, 2011, p. 339) – such a design is called an agent-based design. In this section, agent-based methodologies will mainly be discussed, as will be demands on cultural evolution theories.

Agent-based experiments involve entities that use (a sort of) language. This language is passed on through several generations so that the gradual change of the language can be precisely followed. The agents can be virtual computational models or they can be physical robots and are predisposed with the capacities necessary to recognize the communicative success of a certain linguistic convention, which can be a word, construction, intonation pattern, etcetera. Measuring the ‘success rate’ of such a convention is presumed to be a key ability in the development of language toward a shape which guarantees the most effective and adequate communication. Importantly, the agents are not employed with any bias towards making specific choices or having specific intentions concerning the ultimate shape of the language (Steels, 2011).

Steels (2011) argues that there are three key questions that any account for the development and emergence of language should be able to answer: how do members of a linguistic community come to share the same conventions, how do they come to share the same conceptualizations underlying these conventions and how do hierarchical structures emerge in language?

The answer to the first question, how conventions become shared, is mainly through *alignment*: the selection of a certain linguistic element that is expected to provide the highest chance of communicative success based on previous experience. Every linguistic element therefore has a certain ‘success rate’ associated with it that gets upgraded when using that element results in a communicatively successful situation. It has been shown experimentally that through alignment, which is an aspect of cultural evolution, conventions with a higher communicative success rate came to be used more often, giving rise to the current frequency distribution of those conventions in comparison with competing conventions.

As to the second question, it has been argued that *structural coupling* is a plausible way of accounting for how conceptualizations become shared. Structural coupling involves the shaping and adaptation of conceptualizations underlying conventions based on the outcome (success or failure) of communicative inter-

actions in which the elements that stand for them are used. It has also been attested in empirical research that agents do, in fact, shape and adjust the conceptualizations underlying linguistic conventions based on structural coupling.<sup>4</sup> Cultural evolution therefore can account for linguistic characteristics for which genetics is unable to encode (although Steels (2011) does not specifically explain where and why genetic encoding would fall short).

The third question that Steels (2011) demands cultural evolution theories to answer is how hierarchical structure could emerge within language. He proposes that the first step in this process is the emergence of compositionality: the mapping of an element to a specific meaning in such a way that this element can be used in other contexts while preserving this specific meaning. There are two theories regarding the next step in the process. The syntax-directed account posits that collocating elements are firstly stored as holistic units and get further decomposed and analyzed later on, revealing the underlying structure which can in turn be used in other contexts. The semantics-directed account assumes that hierarchical structure emerges because the different parts of an utterance modify the meaning of an utterance in a hierarchical manner: adjectives modify nouns, adverbs modify verbs, etcetera. Interestingly, the hypothesis that the emergence of compositionality is the first step in the process towards hierarchically structured language is borne out by the results of the study conducted by Kirby et al. (2008), which found that the artificial language evolved in such a way that compositionality was introduced into the language first.

Empirical studies using an agent-based design have thus not only confirmed the role of alignment and structural coupling in the development of language but have also shown that hierarchical structure can arise in the two possible ways discussed. Steels (2011) posits that cultural evolution can thus be said to be a highly powerful mechanism which can, for the most part, account for the current shape of language. There is, therefore, not much left for genetics to explain, which seemingly justifies downplaying the role of biological evolution.<sup>5</sup>

---

4 The introduction by a speaker of a new linguistic element – a new convention with a new conceptualization – thus requires both alignment and structural coupling and poses a problem for the listener: after all, the speaker uses this new element because of lacunae in the already existing set of linguistic conventions which means that the listener himself, who is presumably a member of the same linguistic community, does not have knowledge of this convention and conceptualization himself. This problem can be solved if the speaker uses the new element in analogy to another element that is, in fact, known by the listener, for example, and if the listener takes into account the shared context, the common ground and communicative purposes.

5 There is some criticism to be raised as to experiments making use of robots in this respect. Robotic experiments might indicate that cultural evolution can account for the development of aspects of natural languages, but as long as one does not have a clear picture of the human brain – which will remain to be a long way to go for a long period of time – one cannot know for sure whether what happens in robots is equivalent to what can happen in humans. Robotic experiments therefore have only limited power and validity and

<sup>6</sup>It has been shown that there is a great body of research that has investigated (and endorsed) the external validity of several aspects of the cultural approach. In the next section, some problematic points for the cultural approach will be under discussion.

#### 4 Criticisms and alternatives to the cultural approach

As mentioned in section 1, there is a vivid ongoing debate concerning the processes that have yielded the emergence of language: whether they are essentially cultural or biological in nature or both, whether language development was gradual or saltational, whether language shaped the brain or the other way around, etcetera. Within this debate, criticism has been raised regarding several issues suggested within the cultural approach on language evolution and alternative theories and hypotheses to such problematic aspects have been brought forward. Such alternatives can often be ranged within a framework which takes views that are contrastive with those assumed within the cultural approach, in that it argues that language has evolved as a product of biological rather than of cultural evolution. This opposing framework will be called the *biological approach*. In this section, the main cornerstones of the biological approach will be outlined and more general points of critique on the cultural approach will be provided.

##### 4.1 Language as a biological product

A key paper advocating the biological approach is the one by Pinker and Bloom (1990). The main view of the biological approach is that language emerged as an adaptation, i.e. to fulfill some function that would provide the species it would apply to with an evolutionary and reproductive advantage. The ability to use language therefore became encoded in our genes, resulting in language-specific innate knowledge. Pinker and Bloom (1990) mainly argue in favor of the plausibility of the existence of a language-specific biological endowment based on the thesis that language lives up to two demands on Darwinian evolution: the function to evolve should be complex and there should be no alternative explanation besides genetic evolution that can explain this complexity.

##### 4.2 Arguments against the cultural approach and in favor of the biological approach

The paper by Pinker and Bloom (1990) is mainly directed toward defending the view that language emerged as a result of biological evolution in respect of adherents of a more cultural approach. They do this in two ways: they both reject

---

the development of a methodology to investigate cultural evolution using human participants, as in Kirby, Cornish, and Smith (2008), is an invaluable development in the field.

6 It seems here as if it is assumed that it should firstly be established that cultural evolution is unable to account for the emergence of a particular trait before considering biological evolution as a plausible alternative – biological evolution seems to be nothing more than a makeshift. It could be interesting to consider possible explanations for this reasoning.

arguments in favor of the cultural approach and they recover arguments that have been raised by scholars working within the biological paradigm but that have been rejected within the cultural approach. Both of these aspects will now be discussed, beginning with the latter.

Firstly, Pinker and Bloom (1990) recognize that, as was mentioned in section 3.2, the argument has been raised by adherents of the cultural approach that there are no linguistic universals to be found across languages, rendering it unlikely that a genetically coded language-specific trait has developed in humans. However, the authors state that there are, in fact, linguistic universals, but that these are not superficially visible and should tap onto highly abstract linguistic levels. Research disproving the existence of language universals is thus said to not have dug deep enough. There are, however, two reasons why this rebuttal can be considered to be relatively weak. First of all, Pinker and Bloom (1990) make some suggestions for what form language universals might take, but all the examples they give take the form of negations such as 'no language has characteristic X' which might be said to render these statements weaker than affirmative statements would be: after all, prohibiting one form is less directive than prescribing one form, since the former allows all but one possible form and the latter only allows one. The second reason is that, as was mentioned in section 2.2, biological evolution does not normally occur to abstract properties such as the ones the authors propose.

Secondly, it has been argued that language cannot be an adaptation because it could have been different (it is not completely predictable, therefore it lacks design) and it could have been better (it is not an optimal solution to any problem) and is therefore unlikely to be an adaptation. Addressing the 'it could have been better' argument, Pinker and Bloom (1990) argue that there is always a conflict of interest between language users fulfilling different roles in communication and that there will therefore always be compromises that are seemingly arbitrary from any point of view – language could have been better for one party, but that would have made it worse for another. As to the 'it could have been different' argument, the authors postulate that there is indeed no reason language has the shape that it has but that it does not matter what shapes it takes specifically; what matters is that language users acquire the same shape. It is therefore also irrelevant what shape has been chosen among the different possibilities.

Finally, nonadaptationists have posited that not every aspect of language can be said to have adapted to some function and that adaptation can therefore not account for its development. However, Pinker and Bloom (1990) argue that the fact that for some aspects of language no direct function can be pointed out does not necessarily rule out the possibility of that aspect having developed as an adaptation: "no adaptive organ can be adaptive in every aspect, because there are as many aspects of an organ as there are ways of describing it" (Pinker & Bloom, 1990, p. 19).

Pinker and Bloom (1990) then discuss some arguments against the view that language is a ‘spandrel’, a function that has developed as some coincidental and necessary by-product of the emergence of another function. Although adherents of the cultural approach do not necessarily view language as a spandrel, there is an important argument in favor of language having developed as a spandrel that is shared by many within the cultural approach, namely that “the mind is a multipurpose learning device” (Pinker & Bloom, 1990, p. 25) and that the brain did not adapt specifically for language but for being able to use more sophisticated cognitive functions in general. In this regard, it has been argued that “once you build a complex machine, it can perform so many unanticipated tasks” (Gould, 1979, p. 386). The human ability to use language was therefore more or less accidental. However, the authors note that usage of a machine for a function it was not initially intended for, reprogramming is necessary – it is impossible that language suddenly emerged although it was uncalled for. The authors posit that this reprogramming happened because of natural selection: there was some function language needed to be adapted to fulfill.

One might infer from the above discussion that the arguments delivered in favor of the biological approach leave open the possibility of language having evolved as a genetic product but do not unambiguously point in this direction: it cannot be excluded that language has evolved biologically, but other options are not excluded. The arguments can therefore not be said to refute the cultural approach in any sense. It should be noted that there is very little recent literature in defense of the biological approach, which gives the impression that proponents of the biological approach have cut their losses against the cultural approach. Also, most of the arguments that have been raised in favor of the cultural approach to language evolution have not yet been refuted and are therefore still standing.

## 5 Conclusions

The present paper has discussed the cultural approach to language evolution, according to which natural languages have emerged as a result of cultural transmission, in many of its aspects. Cultural evolution is said to account not only for the fact that humans are capable of using language, but also for the complexity that language came to have. After having provided a general introduction to the main cornerstones of the cultural approach, several studies, especially ones involving agent-based designs, were discussed which seemed to endorse aspects of the cultural approach in such a way that cultural evolution is seemingly capable of meeting the demands on a theory of language evolution. Finally, on the basis of a key paper advocating the biological approach to language evolution, some points of critique to the cultural approach were raised and discussed. It seemed that most of these arguments were mostly used for upholding the plausibility of the biological approach rather than for nullifying the plausibility of the cultural approach. Based on the evidence from empirical studies and the countering of the arguments that have been raised against it, I would like to conclude this paper by positing that many aspects within the cultural approach can be said to be

highly plausible candidates for shedding light on several aspects of the evolution of natural language. ■

Received November 2019; accepted February 2020.

## References

- Boeckx, C. (2013). Biolinguistics: forays into human cognitive biology. *Journal of Anthropological Sciences*, 91, 1–28.
- Bruner, E. M. (1956). Cultural transmission and cultural change. *Southwestern Journal of Anthropology*, 12(2), 191–199.
- Chater, N., & Christiansen, M. H. (2010). Language acquisition meets language evolution. *Cognitive Science*, 34(7), 1131–1157.
- Christiansen, M. H., & Chater, N. (2008). Language as shaped by the brain. *Behavioral and Brain Sciences*, 31(5), 489–509.
- Danchin, E., Giraldeau, L.-A., Valone, T. J., & Wagner, R. H. (2004). Public information: from nosy neighbors to cultural evolution. *Science*, 305(5683), 487–491.
- Gould, S. J. (1979). Panselectionist pitfalls in Parker & Gibson's model for the evolution of intelligence. *Behavioral and Brain Sciences*, 2(3), 385–386.
- King, J. L., & Jukes, T. H. (1969). Non-darwinian evolution. *Science*, 164(3881), 788–798.
- Kirby, S., Cornish, H., & Smith, K. (2008). Cumulative cultural evolution in the laboratory: An experimental approach to the origins of structure in human language. *Proceedings of the National Academy of Sciences*, 105(31), 10681–10686.
- Lenneberg, E. H. (1967). The biological foundations of language. *Hospital Practice*, 2(12), 59–67.
- Mesoudi, A. (2011). Cultural evolution. eLS, 1–8.
- Mesoudi, A., Whiten, A., & Laland, K. N. (2006). Towards a unified science of cultural evolution. *Behavioral and Brain Sciences*, 29(4), 329–347.
- Ohta, T. (1972). Population size and rate of evolution. *Journal of Molecular Evolution*, 1(4), 305–314.
- Pinker, S., & Bloom, P. (1990). Natural language and natural selection. *Behavioral and Brain Sciences*, 13(4), 707–727.
- Smith, K., & Kirby, S. (2008). Cultural evolution: implications for understanding the human language faculty and its evolution. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 363(1509), 3591–3603.
- Steels, L. (2011). Modeling the cultural evolution of language. *Physics of Life Reviews*, 8(4), 339–356.
- Verhoef, T. (2012). The origins of duality of patterning in artificial whistled languages. *Language and Cognition*, 4(4), 357–380.