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# THE THEORY OF NATURAL SELECTION AND THE EVOLUTIONARY ORIGIN OF THE FACULTY OF LANGUAGE WITHIN GENERATIVISM

Daniel Blanco  
Adriana Noemí Gonzalo

**Abstract:** The current debate about the evolution of language within linguistic generativism primarily deals with the intended explanatory scope of the theory of natural selection. This discussion has generated numerous misinterpretations regarding conceptual issues, what makes an explication necessary. This contribution, metatheoretical in nature, means to partially satisfy this desideratum considering how the multiplicity of adaptationist hypotheses affects the controversy. Furthermore, we show the connection between how the faculty of language is characterized as *explanandum* of diverse theoretical perspective, and the explanative approach the parts in the debate are willing to accept.

**Keywords:** Chomsky, Human Language Faculty, Intended applications, Spandrel, Theory of Natural Selection



## 1. Introduction

In this contribution we introduce a philosophical approach regarding some of the contemporary controversies about the evolutionary emergence of the faculty of language (FL) within linguistic generativism, a perspective founded by Noam Chomsky in the MIT community several decades ago.<sup>1</sup> Although we can recognize some conceptual changes in the development of generativism through time, generativists typically think of language as an “organ of the brain”, and have considered and have considered it into different theoretical topics of research. Recently, in the frame of the Minimal Program, Chomsky and his colleagues started to deal with a new one: its evolution. From a bio-linguistic approach, and taking the evolutionary emergence of FL as *explanandum*, this new topic triggered a meta-theoretical debate related to the explanatory role of the theory of natural selection.

The scientific controversy on the phylogeny of FL, a whole area of investigation in evolutionary biology (see, to quote only a few works, Johansson 2005; Fitch 2010), will surely be decided in the empirical arena. But, given that (too) much confusion has appeared due to mutual and numerous conceptual misinterpretations, the priority of a philosophical explication on the topic turns out to be desirable. This paper means to partially satisfy this *desideratum*, not as a mere narrative of the discussion, but as a genuine contribution from philosophy of science to its clarification. We intend to characterize the main positions of the debate together with the central theses defended by the positions. We will see how the recognition of the multiplicity of adaptationist hypotheses helps shed light on the controversy.

The contribution is organized as follows:

In section 2, we briefly introduce a key issue for our purposes: the plurality of adaptationist hypotheses. To understand this aspect of the theory of natural selection will help us to address the dispute about its explanatory scope to specific traits.

Then, in section 3, we set forth the two rival positions on the topic. The first one can be positioned under the scope of the so-called (and well known) "adaptationist

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<sup>1</sup> Generativism is not more than one of many available approaches to FL. Here, we mainly confine this discussion to that perspective, not questioning the adequacy of generativism itself.

program", which claims that the theory of natural selection is a completely satisfactory explanation for the evolution (in our case) of FL.

The second position opens the door to other explanatory theories. Noam Chomsky and many colleagues allegedly are on this second side of the debate. We dubbed this alternative "spandrelism" (Gould and Lewontin 1979) because they often quote structural-related arguments to the detriment of the functional-communicational issue, and also because several times they use this terminology themselves. We characterize the spandrelists' position, emphasizing their particular characterization of FL as *explanandum*, and discussing their suggestions for one or more alternative explanations.

Afterwards, in section 4, we examine Chomsky's support for spandrelism and evaluate typical adaptationist responses to it. We will see that as both adaptationists and spandrelists change the conceptualization of what they want to explain, they also change the plausibility of the available explanations for its evolution. Our goal here is not to take a stand on any of the positions, but to (at least partially) clarify some of the conceptual issues involved in the dispute.

Finally, we offer some conclusions.

## **2. The multiplicity of adaptationist hypotheses**

The explanatory role of the theory of natural selection is at the core of the debate we are dealing with. In order to consider it from a metatheoretical perspective, let us concede that in any given empirical theory we can recognize not only a theoretical component, but also a set of intended applications. Once we accept this, a key issue to clarify the misunderstanding we address is to see that there are many kinds of applications that, in spite of being different in some sense, can be recognized as ones of the same theory, in our case, the theory of natural selection. If that is the case, then, rejecting a particular adaptationist hypothesis for some particular trait does not imply that the theory cannot be applied to that trait in any sense.

The justification for this is that the reasons why traits lead to differential reproductive success are not always the same (survival, obtaining food, spreading, attracting individuals of the opposite sex, etc.). So, what at first glance might seem to be

applications of different theories could be recognized as different cases of application of *one and the same* theory, as long as they all have the same concepts, despite their diversity.

For the sake of the argument, let us grant the following non-specific fundamental law for the theory of natural selection:

Individuals with traits that perform a given function more efficiently, improve their aptitude, thus improving, if the trait can be inherited, their success in differential reproduction (cf. Ginnobili 2018; Ginnobili and Blanco 2019).<sup>2</sup>

Faced with a particular case, we can specify in which sense that trait (and its function) improves the aptitude.<sup>3</sup> To debate about that is not necessarily a discussion about whether the theory can be applied to the origin of that trait or not. Surely, it is a debate within the theory, not about it. This is so because many different kinds of applications can belong to the same theoretical construct, provided that the same theoretical concepts can be recognized in each one of those applications. Again, and as a consequence of this pluralism, to criticize the importance of one kind of selection might not necessarily go against the whole theory at all.

For example, sexual selection, what Darwin himself thought was involved in the evolution of FL as mean of courtship through the production of “true musical cadences” (Darwin 1871, 54) is just one kind of natural selection within many. This means that we can disagree with Darwin, and still being defending the application of the theory of natural selection.

Let us call “ $I(T)$ ” the set of intended applications of any given theoretical construct  $T$ . Set  $I$  contains those parts of the “empirical world” to which the users of  $T$  intend to apply it. Note that there are as many subsets within  $I(T)$  as kinds of selections we are able to distinguish. Then, to consider a trait as an application of one kind of selection or another does not change the fact that it is a member of  $I(T)$ . The same goes if we deal with the set of successful applications of different portions of the same theory  $T$ .

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<sup>2</sup> A hierarchical view of scientific theories can contribute to a more formal approach to this discussion (see, for example, Balzer et al. 1987). We omit this for space reasons.

<sup>3</sup> For more on this particular use of the term “aptitude”, see (Ginnobili and Blanco 2019).

From this we can notice the difference between two kinds of rivalries: one between different evolutionary theories (for example, the origin of a trait  $x$ , is due to natural selection or to genetic drift?), and one between different kinds of natural selection. In the second case, we have a rivalry within one and the same theory, while in the first one not.

We strongly think that to understand the programmatic aspect of adaptationism is central to start to solve the misunderstandings we are about to address in the following sections.

### **3. Explication of Stances**

#### **3.1. Reconstruction of the Adaptationist Position**

Typically, and as has been mentioned many times before, scientists working under the adaptationist program tend to defend a unilateral role in the application of the theory of natural selection to explain the emergence of traits (although they may accept that various evolutionary mechanisms actually take place in nature). But even if a particular scientist is not completely committed to the program, he/she might behave as an adaptationist in certain instances. In our case, adaptationists claim that FL in particular was built by evolution through the exclusive action of natural selection; probably for communication purposes (Pinker and Bloom 1990; Newmeyer 1991, 1998; Pinker 1994, 2003; Jackendoff 1999; Fitch and Hauser 2004; Pinker and Jackendoff 2005; Jackendoff and Pinker 2005). Again, we are not saying that all these authors are extreme adaptationists in every respect, but that they defend adaptationist hypotheses regarding the evolution of FL.

As humans developed FL through the continuing and optimizing work of natural selection from lower forms of communication, it is included in the set of intended applications of this theory, being the participation of alternative explanatory theories not required.

Three aspects of this are helpful for our goals:

(a) On the (allegedly) singularity of the *explanandum*.

FL might be special in the animal realm (perhaps it does not have parallels in non-human communication system whether they are due to common ancestry or to convergences), but that singularity does not disprove that all of them evolved by the incremental action of some kind of selection ( $a_1$ ), nor that the same selective reason was part of all these processes.<sup>4</sup>

(b) On aptitude.

As we have seen in section 2, even if we remain agnostic about which specific aptitude language communication fosters, we can still be under the same program every time we admit that some kind of selection remains as the underlying explanation. This means, as we suggested, that an inner discussion might well take place within this program: perhaps we are dealing with a trait that helped to attract individuals of the opposite sex (as Darwin thought), or that helped survival. This rivalry takes place within the theory of natural selection, and cannot hurt the program since both parts belong to the same theory.

In the same vein, Jackendoff (1999, 272) claimed that he assumes “without justification that any increase in explicit expressive power of the communicative system is adaptive, whether for cooperation in hunting, gathering, defense, or for social communication such as gossip”.<sup>5</sup> If any two scientists defend different aptitudes, they are still discussing within adaptationism. The key corollary is that no matter who wins this discussion, the program is strengthened as a result.

(c) On function.

The program can still be in action even if we leave communication and expressive power aside. The only requirement is to find a function for FL that helps the individual to achieve reproductive success through a particular aptitude. This means that we can have a successful application even if we assign to FL a function different from communication (which is one of many possibilities). Moreover, different functions can

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<sup>4</sup> In this sense, the resolution of the continuity-discontinuity dispute is not necessarily pertinent for the attack against natural selection (cf. Chomsky 2006, 58–62; Balari and Lorenzo 2010, 2017; Bickerton 2014; Longa and Lorenzo 2014). For example, and as Pinker and Jackendoff (2005, 224) wrote, even if we accept that FL is not a homologue of primate calls, this does not imply that originally FL was not for communication.

<sup>5</sup> Multiple scenarios regarding social bonds are mentioned in literature, such as the password/shibboleth hypothesis for group membership (Dunbar 1996; Fitch 2000, 264). Again, virtually all of them can also be conceived as going for natural selection.

lead to the same aptitude, and one and the same function can lead to different aptitudes. In any of these many possible different scenarios, adaptationism wins.

In summary, applied to FL, the law introduced in section 2 is:

Individuals with *language* that performs function  $f$  more efficiently improve their aptitude for  $x$ , thus improving, given that the trait can be inherited, their success in differential reproduction.

As long as we make the specifications, it does not really matter what function  $f$  is (it might be communication or not) or what aptitude  $x$  is tied to (it might be to attract individuals of the opposite sex, as Darwin thought, or not).

### 3.2. Reconstruction of the Spandrelist Position

Although Chomsky was mostly focused on the ontogeny of language in his early writings, lately he has considered the phylogenetic question extensively. Even when his position towards FL seems to be partially modified from work to work,<sup>6</sup> something remains rather unchanged: his objection to the unilateral application of the theory of natural selection for the evolution of FL (Fitch 2000; Hauser, Chomsky and Fitch 2002; Fitch, Hauser and Chomsky 2005; Chomsky 2006; Hauser et al. 2014; Berwick and Chomsky 2016).

Briefly, Chomsky and his colleagues claim that the theory of natural selection is insufficient or inadequate by itself to give account of *what they recognize as* FL. As we shall see, this caution towards natural selection as *explanans* goes hand in hand with their characterization of what FL is.

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<sup>6</sup> Through the last five decades, Chomsky has developed a series of models for language generation (Chomsky 1957, 1965, 1968, 1980, 1986, 1988, 1995). Despite their differences, the idea of the existence of internal universal components and mechanisms of language was always present. It is in the realm of his last model –minimalism– that the study about the evolutionary emergence of FL became a main topic of research.

### 3.2.1. *The Shrinkage of the explanandum*

As is well known, Chomsky and his collaborators (Hauser et al. 2002; Fitch et al. 2005) introduced a central distinction within FL: faculty of language in a broad sense (FLB), and faculty of language in a narrow sense (FLN), leading us to think not only of one, but of two closely related, though different, traits. Let us briefly explicate both.

FLB is a system connected with communication abilities that humans share with a broad range of animals. FLN, on his behalf, is a computational mechanism that allows us to construct unlimited hierarchical and recursive syntactic structures from a pool of lexical items. As we have now two traits, we have two lines of inquiry on evolution: one that has to do with external speech and the equipment for sound-communication (cf. Fitch 2000), and one that has to do with an internal system.<sup>7</sup> Thus, we must distinguish between the machinery for externalization and sound production (which is tied to communication) and the “central processor” behind it (cf. Berwick and Chomsky 2016, 45).

FLB is a trait homologous to at least some communication system(s) in hominids. Considering FLB as *explanandum*, note the difference between this claim and our discussion about the theory of natural selection (what explanatory theory we are willing to accept): one might think that non-hominids communicational systems could have been shaped by natural selection (Hauser et al. 2002, 1572), but that does not change the fact that their own abilities emerged independently of hominids’ communicational systems. Perhaps FLB shows some distinctive characteristics which other animal languages lack, but it still can be due to the action of natural selection and the differences be a matter of degree rather than a matter of kind.

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<sup>7</sup> The description of FLB and FLN is heterogeneous in both papers (cf. Lorenzo, 2008). For example, while in the 2002 contribution they limit FLN to recursive operations; in the 2005 one they say that FLN might include “at minimum” that capacity. We omit the detailed description of these discrepancies for space reasons. However, note that these authors’ intention is to belittle FLB (not every representative of cognitivism would agree with them on this). Moreover, even when in both papers FLN is introduced as a subset of FLB (Hauser 2002, 1571; Fitch 2005, 181), the authors clearly preserve the distinction when offering an evolutionary explanation for them. If one trait is not but a part of the other, it seems difficult to think in a different explanation for the former given that we already have one for the latter. However, it is not impossible: the reasons why the legs of a rooster evolved might be different from the reasons why its spurs evolved, even when one might think of the spur as a part of the leg. Here, we preserve the distinction.



Regarding FLN, Chomsky and colleagues maintain: (i) that FLN can only be properly found in humans (you cannot find syntactic recursion in non-human forms of communication); and (ii) that FLN is inseparable of FL (no human language lacks recursion).

Note that even if both (i) and (ii) were false, this does not deny their central point: a theory alternative to natural selection is involved in the explanation of the emergence of FLN. In fact, and against (ii), recent studies doubt about the universal presence of recursion in human languages (Everett 1988, 2012); but that Chomsky and colleagues are wrong or that the theory of natural selection is the right answer do not follow from this. However, they strongly (and perhaps unnecessarily) link this characterization of his *explanandum* with their defense of alternative theories as *explanans*.

The strategy is to narrow down the *explanandum* to FLN, a recently evolved computational system in our brains for merge and recursion as it appears in syntax, thus reducing *the linguistic fact* to be explained.

From this new focus, the argument from design (which intends to be blocked by the theory of natural selection) is found wanting, unnecessary, and then, spandrelists say, natural selection is no longer a suitable hypothesis to explain the emergence of FL (Hauser et al. 2002, 1573). You do not need much to explain so little. Just “some slight rewiring of the brain” produced suddenly is good enough for FLN to appear (cf. Berwick and Chomsky 2016, 67, 79, 164; cf. Chomsky 2000, 4; Longa et al. 2011; Hauser et al. 2014, 6).<sup>8</sup>

Note that spandrelists are following the exact opposite strategy than that of a creationist: while the latter would say that it is virtually impossible that something so complex “as language has evolved through the incremental steps of natural selection” (Corballis 2017, 28), they say that the action of a designer (natural or not) is not

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<sup>8</sup> The usually quoted gene related to FL is FOXP2 (Fitch et al. 2005). Sometimes the allegedly sudden evolution of FL has been tied to theories about the cinematic of evolution such as punctuated equilibria. However, this is misleading once we realize that the latter has to do with the velocity of speciation and its consequences for the geological record, which is not necessarily against the typical Darwinian gradualism at all (see Corballis 2017, 44). In other occasions, saltationism and/or macromutations are mentioned (Hauser et al. 2002; cf. section 4.2) what might be read as going against this shrinkage.

necessary because we are explaining something so minimal (more on this in section 4.3).<sup>9</sup>

Another argument spandrelists use is imperfection: as FL is a combination between FLN and FLB, they underline an alleged mismatch between the “perfect” device for inner thought and its externalization in the phonological system. As we find imperfections while linking FLN with communication, natural selection results to be an unsuitable explanation for its origin. In the same vein, Berwick and Chomsky (2016, 23; cf. Knight 2016, 13) argued that natural selection working through time would produce optimal traits, and that language for communication (the combination of FLN and FLB) is not one of them.

But, if it is not natural selection, what is behind FLN?

### 3.2.2. *The Broadening of the Explanans*

Curiously, as a result of the reduction of the *explanandum*, the *explanans* for FL turns out to be broadened: we still have FLB as a member of the set of intended application *I* for the theory of natural selection, but also a new theory (whichever it might be) is mentioned to explain the distinctively human FLN.

This can lead to two different interpretations: either (1) FLN is a member of the sets of intended applications both of the theory of natural selection and of an unidentified alternative evolutionary theory (weak version of spandrelism, a rather pluralist perspective); or (2) FLN is only a member of the set *I* for the alternative evolutionary theory, leaving natural selection aside (strong version of spandrelism).<sup>10</sup> In both cases, FLB is an intended application that exclusively belongs to the theory of natural selection.

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<sup>9</sup> Surely they are wrong when inferring that the theory of natural selection should be invoked only while dealing with complex traits. We will return to this in section 4.1.

<sup>10</sup> Of course, set *I* for the theory of natural selection and set *I* for the alternative theory can be of non-empty intersection, as long as FLN is not a member of that intersection.

## 4. More on Chomsky's position on the emergence of FL

### 4.1. An Ambiguous Beginning

Distancing themselves from the adaptationist program, Chomsky and other spandrelists have claimed that FL (strictly, FLN) is just a spandrel (Gould, 1987, 1988, 1989, 1991, 1993; cf. Piattelli-Palmarini 1989; Lightfoot 2000): communication, though obviously linked to FL, is just a side-effect of what originally was an instrument of thought (cf. Jackendoff 1999, 272). However, this is not necessarily illuminating as long as “spandrel” itself is a polysemic term.

To explicate this, Gould and Elisabeth Vrba wrote the now classic article that might be considered as a continuation/extension of (Gould and Lewontin 1979). Here, they talk about “exaptation” instead of “spandrel” (Gould and Vrba 1982; cf. Gould 1993). In short, an exaptation is a trait whose current function cannot be held as the reason for its original emergence.

For any given exaptation, we can have one of two scenarios: (a) a weak version of exaptation: a trait that was originally shaped by natural selection for a selective/functional reason different from the current one, which was subsequently co-opted; or (b) a strong version of exaptation: a trait that was initially created by non-selective forces and adopted the current function afterwards.<sup>11</sup>

The common factor in (1) and (2) has to do with a “co-opted” function, that is, when an innovation arises, it does so independently of the functions that it will eventually be selected for. It might be obvious that FL has the function of communication, but if FL is an exaptation, then, by definition, communication cannot be the reason for its original emergence (cf. Berwick and Chomsky 2016, 39, 65). Note that whatever version of exaptation we take for language, it helps us to get rid of communication as the specific function to explain its primitive evolution. However, if

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<sup>11</sup> Our decision to speak about “weak” and “strong” exaptations is based on two issues: firstly, Gould and Vrba (1982) say that if they had wished to explicate only what we call exaptation in the weak sense, they would have not written the article at all (cf. Gould 1997). Secondly, it is only in the emergence of an “exaptation in the strong sense” that the theory of natural selection is not active, so that an adaptationist would be more unwilling to accept this latter type of exaptation than the former one (Gould 1991). In his last intellectual contribution, Gould (2002) carries out a more sophisticated conceptualization regarding exaptations. However, this weak-strong dichotomy is good enough for our goals.

our target is the set  $I$  of the theory of natural selection, more work has to be done, because in (1) natural selection still has a key role to play (we still have a function in the beginning, only that it is not communication), while only in (2) it is virtually absent.

Intuitively, and as Gould and Lewontin wanted to attack the adaptationist program, a spandrel is closer to scenario (2) than to scenario (1).<sup>12</sup> As we suggested, a scientist under that program would be perfectly untroubled with scenario (1) as long as natural selection is always in action, despite the diachronically changing utility, because, in (1) the trait is still adaptive, no matter its function. Taking all this into account, we face two possibilities:

Possibility 1: FLN initially emerged within a selective purpose different from the current one, and then the trait was co-opted to its present communicative function (the process of externalization) in FL.

Possibility 2: FLN emerged by non-selective reasons, and then the trait was co-opted to its present role in the externalization/communicative function in FL.

Possibility 1 leads us to think that FLN is a case of weak exaptation, a position entirely compatible with adaptationism; while Possibility 2 leads us to conceive the emergence of FLN as a case of strong exaptation, that is, as a case of spandrel.

For any of these interpretations, a diachronic perspective for the determination of  $I$  is necessary (now  $I$  is seen as an open set that wins and/or loses elements through time given that its extension is decided pragmatically by the users of the theory). In both cases, different forces are in action in the evolutionary history of the trait.

If the evolutionary novelty initially had to do with any function that natural selection could use (Possibility 1), then Chomsky, Hauser and Fitch's position can be considered as being under the adaptationist program. But if natural selection only arrives late to the scene, then FLN can fairly be considered a spandrel (Possibility 2, cf. Piattelli-Palmarini and Uriagereka 2005; Lorenzo 2006, 91).

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<sup>12</sup> Literally, this is also the case for actual *spandrels*. After all, *spandrels* are architectural pieces designed for reasons of structural/stability need. Only an *unskilled* observer might conclude that the reason for the *spandrels* is current ornamentation.

Note the following (and rather contradictory) quote:

We consider the possibility that certain specific aspects of the faculty of language are ‘spandrels’ —by-products of preexisting constraints rather than end products of a history of natural selection. This possibility, which opens the door to other empirical lines of inquiry, is perfectly compatible with our firm support of the adaptationist program. Indeed, it follows directly from the foundational notion that adaptation is an ‘onerous concept’ to be invoked only when alternative explanations fail. The question is not whether FLN *in toto* is adaptive. By allowing us to communicate an endless variety of thoughts, recursion is clearly an adaptive computation. The question is whether particular components of the functioning of FLN are adaptations for language, specifically acted upon by natural selection—or, even more broadly, whether FLN evolved for reasons other than communication. (Hauser et al. 2002, 1574; cf. Fitch et al. 2005, 183)

We strongly think that an adaptationist would not be exactly comfortable with this description basically for two reasons: (a) because a historical sense of adaptation has to do, precisely, with natural selection working from the beginnings of the appearance of the trait (Burian 1994; West-Eberhard 1994); and (b) because when you “firmly” work under a program, you do not use that program “only when alternative explanations fail”, but, on the contrary, you intend to use it all the time in a non-restrictive way.

Again, if FLN “evolved for reasons other than communication”, and those are not functional (as it seems to be the case, given that language is a “by-product of preexisting constraints rather than end products of a history of natural selection”), then Chomsky and his colleagues definitely stand for FLN as a strong exaptation, that is, as a spandrel, and their view cannot be embedded under adaptationism. Possibility 2 is the case.

However, if communication is co-opted from one or more former functions, then FLN is not a spandrel, but “merely” a weak exaptation, a view entirely compatible with adaptationism. Pinker and Jackendoff seem to read Chomsky and colleagues following this interpretation:

[Hauser, Chomsky and Fitch 2002, 1578] speculate that recursion, which they identify as the defining characteristic of the narrow language faculty, may have ‘evolved for reasons other than language’. Specifically, recursion could have evolved in other animals ‘to solve other computational problems such as navigation, number quantification or original social relationships’, in a module that was ‘impenetrable with respect to other systems’. During the evolution, the modular and highly-domain-specified system of recursion may have become a penetrable and domain-general. This opened the way for humans, perhaps uniquely, to apply the power of recursion to other problems. (Pinker and Jackendoff 2005, 229)

As we can see, we have now recursion originally evolving to solve other problems, and then being co-opted for language communication. Function might have changed through time, but FLN is functionally active from the beginning. Then, FLN is a genuine adaptation (it was shaped being a target of natural selection), but one that does not involve communication. Now Possibility 1 is the case.

What is, then, what Chomsky is standing for?

#### 4.2. Chomsky's perspective on FL as a spandrel

Notwithstanding the ambiguity of his first attempt to address the problem, recent writings clearly position Chomsky under Possibility 2.<sup>13</sup> Now the emergence of FLN receives a rather radical *structuralist* perspective. Once again, he links the spandrelist explanation to a specification/reduction of the *explanandum*: the *divide et impera* strategy.

By dividing FLB in two, now Chomsky (writing with Robert Berwick) talks about three traits related to FL: (1) a sensorimotor component; (2) a conceptual-intentional system of inference; and (3) FLN:

We can now effectively use a strategy of 'divide and conquer' to carve the difficult problems of the evolution of 'language' in three parts, as described by the basic property: (1) a computational system that builds expressions hierarchically structured with systematic interpretations on the interfaces with other two internal systems, namely, (2) a sensorimotor for outsourcing as production or analysis and (3) a conceptual system of inference, interpretation, planning and organization of the action - what is informally called 'thinking'. (Berwick and Chomsky 2016, 11)

Both (1) and (2) have to do with FLB, and they do not deny that these components have evolved by natural selection in pre-human species. However, natural selection has nothing to do with the origin of (3). With (3), they are not thinking of vocalization. In fact, Chomsky thinks language design is unimpressive, "dysfunctional" and not very well adapted for communication (Chomsky 1995, 162). Given this not-well-designed-for-communication characterization of language, together with his efforts

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<sup>13</sup> However, in Chomsky's earlier writings we already find expressions such as "responses [to the origin of language] may well be not so much the theory of natural selection, but molecular biology" (Chomsky 1988, 167) or that the explanation may be connected to "certain physical laws related to neuronal packing or regulatory mechanisms." (Chomsky 1980, 100)

in cutting off FLN from other components of language (literally, “a narrower language phenotype”), he avoids the necessity of natural selection:

It should be clear that narrowly focusing the phenotype in this way greatly eases the explanatory burden for evolutionary theory—we simply don’t have as much to explain, reducing the Darwinian paradox. (Berwick and Chomsky 2016, 11)

While focusing on FLN, they emphasize the role of structures and syntactic objects within the mechanisms of performance and economy of mind. Language did not begin as its externalization, but as a trait related to internal thought (Berwick and Chomsky 2016, 74).

The core syntax is "disconnected" from any type of environmental motivation. The origin of the formal grounds of syntax is explained by what was called “the Third Factor”, which has to do with principles of structural architecture which affect the computational efficiency of external systems<sup>14</sup>. Then, FLN was generated from non-specific factors such as (1) genetic ones; (2) experience; and/or (3) general principles of structural architecture or principles of computational efficiency.

In a preceding article, Chomsky wrote:

Emergence of unbounded Merge at once provides a kind of ‘language of thought’, an internal system to allow preexistent conceptual resources to construct expressions of arbitrary richness and complexity. [...] At that stage, there would be an advantage to externalization, so the capacity would be linked as a secondary process to the sensorimotor system for externalization and interaction, including communication—a special case, at least if we invest the term ‘communication’ with substantive content, not just using it for any form of interaction. It is not easy to imagine an account of human evolution that does not assume at least this much, in one or another form. (Chomsky 2007, 8–9; cf. Chomsky 2005; 2010)

Later, Berwick and Chomsky continued with their attack to the introduction of FLN as a member of the domain of application of the theory of natural selection, fostering different perspectives:

We have known for some time now from both theoretical and empirical research that Darwin’s and the Modern Synthesis views were not always accurate, and there is ample field evidence to back this up [...] all without the need to reject Darwinism wholesale; invoke viral transmission, large-scale horizontal gene flow, or miracle macromutations; or

<sup>14</sup> In fact, “the Third Factor” is an expression used with different purposes; either to explain the acquisition of language or to explain the evolution of language (cf. Chomsky, 2005, 2007, 2010; Longa et al. 2011; Lorenzo 2006, in reference to Williams, 1966).

even incorporate legitimate insights from the field of evolution and development, or ‘evo-devo’. (Berwick and Chomsky 2016, 26)

However, many problems remain. For example:

(1) What is the identity of this alternative-non-adaptive empirical line of inquiry? Is it a single theory or several ones? Is it genetic drift? Is it a result of “neuron packing or [of a] regulatory mechanism” (Chomsky 1980, 100)? Is it a theory in the realm of molecular biology (Chomsky 1988, 167)? Do we have to look into the sciences of complexity and auto-organization (Longa 2001) or in the evo-devo field (Chomsky 2010)? Is it really true that “the generative procedure emerged suddenly as the result of a minor [random] mutation” (Chomsky 2010, 70; cf. Chomsky 2000, 17; Fitch 2000, 259)? Unfortunately, Chomsky’s proposal is (to say the least) vague. What he denies is more or less clear. What he asserts is not.

(2) Due to his minimalist perspective of the *explanandum* (FLN is reduced to the recursive computational mechanism), Chomsky definitely leans to Possibility 2 in spite of Possibility 1. But, if he is meant to reject the theory of natural selection to explain FLN, why does he insist on talking about primitive functions for FLN such as navigation, numerical cognitive systems, or other tools of thought? Again, as discussed above, this can be easily interpreted as going for adaptationism, not against it.

### **4.3. Reactions from Adaptationism: The Non-miracle Argument**

Roughly, the reaction against spandrelists follows two strategies. Firstly, they emphasize the adaptive role of FL, so that its evolution *in toto* should be due to natural selection. The argument has similarities with the non-miracle argument in the debate on scientific realism: if a lot of aspects should be “aligned” for us to have FL, then only natural selection (or a miracle of nature) could do that kind of work (cf. Pinker and Bloom 1990; Pinker and Jackendoff 2005; Longa et al. 2011; Corballis 2017, 27–34). Once we agree that FL is in fact complex and not a minimal trait, then the necessity of natural selection increases. Again, we can see here the connection between what one means for FL and what explanation one is willing to accept.

Adaptationists show that the reduction in the *explanandum* is misleading, and emphasize the numerous and complex evolutionary changes that allowed the emergence



of vocalization (descent of the larynx,<sup>15</sup> shape of the tongue, etc.) together with any internal component necessary for it. In this sense, FL involves a set of aspects that should be in harmony with each other in order to be of any use (cf. section 3.2.1).

For this reason, we think Corballis is wrong when he says that Chomsky is “the most prominent present-day miraculist” because Chomsky wants us to accept that language evolved suddenly (Corballis 2017, 29). This begs the question: as we have said, Chomsky goes against the application of the theory of natural selection because he thinks language is not complex at all. On the contrary, “miraculists” usually speak about the impotence of the theory of natural selection to explain the origin of complex organs, while it seems that Chomsky would be pleased to accept it to explain them. Again, what selectionists have to show is how complex the explanandum is in order to make explicit the advantages of accepting the theory of natural selection. Only if Chomsky accepts this complexity we can position him on the side of miraculists (Ibid., 30).

Also, and as natural selection is often associated with a gradual and continuous cinematic in evolution, the alleged continuity between humans and other hominids is stressed: FL evolved by the tireless incremental action of natural selection through time, from gestures and noises associated with ideas to proto-language and then FL (cf. Bickerton 1990; Jackendoff 1999; Corballis 2017).

Moreover, it has been argued that navigation is not a discrete infinite system, as linguistic recursion; while the recursive numerical cognition seems to be derived from language, rather than vice versa, because language maps among the recursive systems instead of being its simple externalization. With arguments like this, supporters of adaptationism try to mine the credibility of the co-option hypothesis.

Secondly, they adopt Possibility 1. As we saw, if we have FL as a case of weak exaptation, then this is perfectly compatible with adaptationism:

We note that the suggestion that recursion evolved for navigation (or other cognitive domains) rather than language, [...] assumes a false dichotomy: that if a system originally underwent selection for one function, it did not undergo subsequent selection for some other function. Just as forelimbs originally were selected for stability in water and subsequently were selected for flight, legged locomotion or grasping, certain circuitry could have been shaped by selection for (say) navigation and subsequently was *reshaped* by

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<sup>15</sup> Against this interpretation, Fitch and Reby (2001, 1674) have claimed that “non-speech factors might have influenced laryngeal lowering in our lineage”, given that “laryngeal descent occurs in species that lack speech”.

selection for language. (Pinker and Jackendoff 2005, 229-30; see also Corballis 2017, 42–43)

The increase in brain function that led to structural restrictions in FL could be an exaptation, which is not incompatible with the successful application of the theory of natural selection to the evolution of this trait at all.

## 5. Conclusions

Our intention was to partially explicate the debate within the Generativism regarding the evolution of FL. Our strategy was to follow a metatheoretical frame that helped us to clarify the points in dispute, including the untrammelled (and inappropriate) use of some key concepts such as exaptation, adaptation, and spandrel. A hierarchical perspective of scientific theories, together with the identification of a fundamental law within the theory of natural selection and its set of empirical application also contributed to our explication. We have seen how any given programmatic theory involves a set of intended applications that results to be pragmatically unrestricted thanks to its users.

Furthermore, now in the realm of scientific explanation, we specified that, in this debate, how what one wants to explain is determined has a lot to do with what explanative approach is going to be accepted. Chomsky characterizes FL as a mechanism that self-installs in the human mind-brain. For him, FL includes FLN, which he considers to be a spandrel, unlike other components that he considers being adaptations in the traditional sense (traits created by natural selection). We think Chomsky's move is clever: if FL is complex, the theory of natural selection becomes suitable, but if the focus can be reduced to FLN (the internal computational component of language in the mind/brain), a minimal trait, then, alternative theories can also be taken into account, just what Chomsky intends to incorporate. For Chomsky, FLB can be explained through the theory of natural selection, but FLN cannot, so that a different alternative theory has to be proposed to explain its evolution.

We also explicitly stated that even when a scientist under the adaptationist program could agree with Chomsky regarding the singularity of FLN, he/she might not exclude the theory of natural selection as its *explanans* anyway. Again, he/she just can

stress that it is singular and complex at the same time. But even if we are facing a not-complex trait, that is not enough for us to reject the theory of natural selection as an explanation. It simply has no sense to narrow down the potential applications of the theory of natural selection to the “chunks” of reality where it is necessarily the only available explanation. The fact that the theory of natural selection can explain the origin of complex traits does not imply that it cannot explain the origin of simpler ones. For adaptationists, natural selection is the privileged explanation for the evolution of traits. Then, in this context, adaptation is anything but an “onerous concept only to be invoked when alternative explanations fail”.

To conclude, and as final critical remarks:

- Chomsky sometimes seems to be confusing which rival he is attacking: one thing is to go against communication as the original function for FL (so that FL should be treated as an exaptation), and another thing is to conclude from that that language is a strong exaptation. Again, to deny a particular function for a given trait alone is not a sufficient condition to refuse the application of the theory to explain the origin of that trait. If Chomsky “merely” changes functions (deny communication or externalization, embrace instrument of thought or some cognitive ability), the theory of natural selection is still there, perfectly available. If he does endorse the option that claims that FL is a spandrel, one would wish to have a clearer vision of his insights.

- What the alternative explanatory theory is for Chomsky remains unclear. This should be specified for scientists to think on crucial experience that could decide between it/them and the theory of natural selection as *explanans*; and also, for philosophers of science to explicate it. The evolution of FL might still be a mystery and the available evidence might be scarce to decide between these rival theories (cf. Lightfoot 2000, 234; Fitch 2002; Hauser et al. 2014; Knight 2016), but that is another thing altogether. In addition, note that if we find fossil evidence for the evolution of hominid traits for communication, what we will have found, while sufficient to conclude the presence of FL as Chomsky understands it, is not really necessary for it.

- Even when we hope to have shed light with some clarifications in this contribution, a definitive explication of the discussion on evolutionary explanations for FL cannot be achieved until the alternative explanatory theory/ies is/are specified.

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