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EXPLORING FRAMEWORK BIAS: THE CASE OF MINIMALISM VS PARALLEL ARCHITECTURE IN STUDIES ON LANGUAGE EVOLUTION

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ABSTRACT. ***Exploring Framework Bias: The Case of Minimalism Vs Parallel Architecture in Studies on Language Evolution.*** The present paper explores the issue of framework bias through the analysis of two lines of study concerning language evolution, one framed by the Minimalist program and one by the proposal of Parallel Architecture of language. Framework bias, as proposed in this study, raises the question of the degree to which the theoretical framework chosen for a certain line of research will influence the design of an experiment, the selection of data, and therefore the analysis and final results. The studies presented in this paper tackle the same topic (language evolution) using the same parameters for research (gradual versus saltational evolution; continuation versus exaptation; and unique versus shared property) but reach significantly different conclusions because of their respective theoretical framework.

Keywords: *framework bias, Minimalism, Parallel Architecture, language evolution*

REZUMAT. ***O explorare a influenței cadrului teoretic asupra rezultatelor cercetării: Programul Minimalist vs Arhitectura paralelă a limbajului în studii despre evoluția limbajului.*** Lucrarea de față explorează problema bias-ului creat de cadrul teoretic prin analiza a două linii de cercetare asupra evoluției limbajului, una centrată pe programul minimalist, iar cealaltă pe teoria arhitecturii

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paralele a limbajului. Bias-ul de cadru teoretic, astfel definit în lucrarea de față, ridică problema măsurii în care cadrul teoretic ales pentru o cercetare influențează design-ul unui experiment, alegerea corpusului de analiză, și implicit analiza în sine și rezultatele aferente. Studiile prezentate în această lucrare abordează aceeași temă (evoluția limbajului) folosind aceiași parametri de cercetare (evoluție graduală vs saltațională; continuare vs exaptare; și proprietate unică sau comună) dar ajung la concluzii semnificativ diferite din cauza cadrului teoretic ales de fiecare studiu în parte.

Cuvinte-cheie. bias de cadru teoretic, programul minimalist, arhitectura paralelă, evoluția limbajului

1. Introduction

The theory of language we use as a theoretical framework will often influence the way a hypothesis is formed, an experiment is designed and carried out, and ultimately our interpretation of the data. This is not only because of the personal bias that comes with a certain theoretical framework, but because each theory of language will focus on something else, and it will dictate a certain way of formulating questions and thinking about possible answers. As Jackendoff writes in his 2010 *Your theory of language evolution depends on your theory of language*, "depending on what your theory of syntax and semantics and rules and lexicon looks like, you're going to seek different sorts of comparative evidence, both across the rest of human cognition and across the animal kingdom" (Jackendoff 2010: 72); different data sources—even if subjected to the same methodology—will yield different findings. This is what I consider and define here as framework bias.

For the purpose of this article, I explore the concept of framework bias as exemplified in two lines of inquiry on language evolution. This can be a challenging task, as it has been pointed out in Boeckx (2021), because "many linguists' theoretical considerations (what is the "right" analysis for indirect questions, or interjections, or infixation, etc.) do not bear on answerable evolutionary questions" (15). However, as I hope to show in this attempt, I believe that the salience of different aspects of the phenotype will inform the way in which researchers go about looking for evidence, in a similar way to how in designing a questionnaire, people will sometimes ask questions containing presuppositions that will guide answers into a desired space. Researchers tackling language evolution might tend to look for evidence that proves that whatever they deem

more important in the manifestation of language (be it syntax, pragmatics, lexicon, the articulatory mechanism, etc.), is more relevant, more central, older, or whatever other comparative term the research itself demands.

The two frameworks that anchor the studies presented in this paper are both part of the biolinguistics enterprise: the Minimalist Program and the Parallel Architecture Theory of Language. The issue of language evolution has long been discussed in terms of a philosophical dialogue, with perhaps mythical and religious implications. Yet now, it has moved towards "the domain of scientific investigation" (Wacewicz et al 2020: 60). The question of *why* language has evolved implies two different aspects that contour the lines of scientific inquiry into this field: *how come* and *what for*. How come humans have evolved into speaking beings through this faculty of language, and what is the main evolutionary pressure that made way for its development? Besides these two main questions that frame the study of language evolution, the authors of the studies discussed here consider the same parameters for the evaluation of language evolution: gradual versus saltational evolution; continuation versus exaptation; and unique versus shared property. Not surprisingly, we have different answers from the two different frameworks. In what follows, I first briefly present the two frameworks, and then the lines of inquiry related to the evolution of language, with examples that show the different approaches taken by the authors.

2. Biolinguistics

Biolinguistics is an enterprise according to which the methodology for studying language needs to be intertwined with biology. Its place of origin and history is a seat of debate in the linguistic community, some believing it originated around the 1950s when more linguists started working with biologists and neuroscientists to understand language and move away from the central behaviorist theories about language acquisition (Boeckx 2013), while others believe it to have been an approach already present within certain theoretical frameworks. Whichever might be the case is not important for the present study. More important than when it started is what biolinguistics asks of language research. We now understand language as a faculty of our brains and a system in itself, an organ with its own anatomy and physiology. When we want to study it, the questions we start asking refer to the functions that form the basis of language. However, the entire approach within biolinguistics calls for concrete data whenever observation on language occurs, as well as good experimental design, as is the norm in biology (Fitch 2009). Importantly, now we ask from where do we obtain said data? Since the language we speak as adults is puzzling through its sheer complexity, we turn to instances where the system is either in its infancy and

development, or where it presents errors. So, evidence from child language acquisition and from aphasia patients is hoped to help us make sense of what the primary, most basic principles of language are. Besides these, a core approach in biolinguistics has been a comparative one, where studies of animal cognitive and speech-like behavior are considered (Fitch 2018).

The two theories or proposals framing the debate on language evolution presented later on in the study are part of the biolinguistic enterprise, meaning they follow methodological guidelines and expectations for research found in biolinguistics. In the following sections, I offer a brief overview of these frameworks and their respective methodologies.

2.1. The Minimalist Program

The Minimalist Program (MP) is a proposal that evolved naturally within the generative enterprise. After the development of the Principles & Parameters framework which sought to ideally explain the architecture of the language faculty, Noam Chomsky considered it necessary to push the program further, "beyond explanatory adequacy" (Chomsky 2001a), and ask the question of "why does FL [the language faculty] have this sort of architecture?" (Boeckx 2015: 431). This question enlarges the scope of MP to also consider the relation of the language faculty with broader cognitive and biological systems. The quest of MP is to seek and ultimately prove that the linguistic computational system efficiently and elegantly works together with other cognitive systems, through "the most efficient algorithm" (Boeckx 2015: 432), and through it alone. In this way, MP is tightly interconnected with the idea of biolinguistics; this enterprise "adopts the standard ambitions of natural science when investigating a biological phenomenon: to develop an explanatory account of whatever lies behind the observed data […] and of its physical implementation and evolution" (Mobbs 2015: 7). MP has had a few iterations, and I will present here a synopsis of the shift in the paradigm of minimalist analysis.

2.1.1. The methodology of minimalist linguistic analysis

Linguistic minimalism is a program; in this sense, it provides a series of principles according to which linguistic analysis is to be carried out, but it does not claim itself to be a theory. This allows it to work with assumptions and constraints, test them, and eventually reinforce the sustained ones to regulate further analysis.

The principles of linguistic minimalism are tightly related to efficiency and simplicity; the goal of this program is to cut out redundancies and superfluous stages in the derivation of language. Seeing as it is part of a generative enterprise,

MP deals with I-language[2], more exactly, Chomsky proposes a way of analyzing I-language from below, inquiring about the appropriate definition and structure of this system.

> Throughout the modern history of generative grammar, the problem of determining the character of FL [the language faculty] has been approached from "top down": How much must be attributed to UG [universal grammar] to account for language acquisition? The MP seeks to approach the problem "from bottom up": How little can be attributed to UG while still accounting for the variety of I-languages attained. (Chomsky 2007: 4)

Among the most important principles for minimalist analysis, we find the principles of Least Effort and Last Resort, principles that guide operations in the linguistic derivation; Last Resort "has been extended to all syntactic relations and has led to the development of highly constrained […] models of grammar" (Boeckx 2015: 435). Merge is the central operation which guides the derivation, which in turn is defined by binary branching. The sequencing of functional heads has been a part of MP but has now shifted to become the focus of the Cartographic project.

To further minimize the burden of computation at interface levels, more recent ideas within the MP have

> de-emphasized the role of specific features in driving syntactic computations and paid more attention to the consequences of assuming a more derivational architecture, where small chunks of syntactic trees (aka "phases") are sent cyclically to the interfaces […]. This type of approach […] seeks to turn the economy principles of the early minimalist period into theorems. (Boeckx 2015: 435)

The strongest minimalist thesis stresses the importance of minimizing and optimizing the number of operations involved in the derivation of language. Its proponents claim that simple operations and interactions need to be the basis for the many diverse manifestations of language. With this, "minimalism marks the end of grammatical modules" (Boeckx 2015: 436), moving towards exploring broader cognitive mechanisms at play, and consequently trying to integrate linguistics into the broader cognitive sciences, to work together with other fields for the goal of forming a general theory of cognition.

[2] "An I-language is a computational system that generates infinitely many internal expressions, each of which can be regarded as an array of instructions to the interface systems, sensorimotor (SM) and conceptual-intentional (CI)." (Chomsky 2007: 5)

2.2. The Parallel Architecture

Whereas the MP is a framework centered around one system of language (i.e., syntax), proponents of the Parallel Architecture (PA) (mainly Jackendoff, but also others) argue that the framework most likely to yield results is one centered not on one particular system, but rather on the interfaces between systems. This is argued for in terms of the diversity of elements that comprise the language system and the diversity of their combinatorial power. The fact that the main structures of language (phonology, semantics, etc.) "can be dissected into semi-independent structures" (Jackendoff 2015: 596) represented a core motivation for the development of a parallel architecture for language.

2.2.1. Simpler Syntax

One feature of PA is that it extends what we consider the lexicon to comprise not only words as units, but also syntactic structures and semantic complexes linked to words and fixed expressions. Whatever is contained in memory is considered to be part of the lexicon.

> PA treats [syntactic rules akin to VP -> V – NP] as a stored piece of structure; it can therefore be localized in the lexicon […]. Thus, to the extent that there are autonomous principles of syntax such as fixed head position, availability of ditransitive constructions, the means for forming relative clauses, and so on, these are stated in precisely the same format as constructional idioms, and they therefore belong in the lexicon as well. (Jackendoff 2015: 601)

This idea, along with the fact that PA being an interface-centered framework takes the burden of carrying the entire informational load off of one single level of structure, allows syntax to be simplified in terms of its combinatoriality. Simpler Syntax, in the terms of PA, means then that "syntax functions in the grammar not as the fundamental generative mechanism but rather as an intermediate stage in the mapping between meaning and sound" (Jackendoff 2015: 609).

The effects of this Simpler Syntax on the methodology of linguistic analysis include the need for non-binary trees; the assignation of regulating some rules of grammar and syntactic distinctions to linear order; the reduction of empty nodes to a minimum; lack of movement; and lack of Logical Form and any analogue "covert level of syntactic structure" (Jackendoff 2015: 611). However, it is also necessary to include some more mechanisms to account for other specific problems, such as a "grammatical function tier (GF-tier)" (Jackendoff 2015: 612) for cases of A-movement such as passives or raising constructions. Finally,

many other features of language explained in MP and other syntacto-centric frameworks through syntax-reliant mechanisms are passed over to Conceptual Structure in PA.

2.2.2. Conceptual Semantics

Conceptual Semantics is the core theory of PA. It is a very complex semantic theory that relies on a mentalistic perception of language, and which also acknowledges the primacy of thought and meaning over language abilities. Looking at empirical evidence of the type acquired by primate studies or pre-linguistic children observations, the authors of PA propose that accepting the primacy of meaning to linguistic expression "helps satisfy the goal of 'beyond explanatory' adequacy: it helps explain why (some part of) the semantic system of language is the way it is, because it is built upon pre-existing primate cognition" (Jackendoff 2015: 603). Once again contrasting MP, in PA one can take meaning to be independently universal, or at least not derived from syntax.

The system of meaning within the theory of Conceptual Semantics is composed of two combinatorial sub-systems: Spatial Structure and Conceptual Structure. Spatial Structure is "a central level of cognition that codes the physical world in a relatively modality-independent fashion" (Jackendoff 2015: 604), a level which the author compares to a visual system but admits that knowledge via other senses contribute to it. Conceptual Structure, on the other hand, consists of features and functions. It is also part of the central cognition, but it contains distinctions which cannot be perceived through senses, such as:

> (14) a. the type-token distinction, distinguishing categories from individuals
> b. taxonomic relations: 'X is an instance/subtype of Y'
> c. temporal relations: 'X is past/future'
> d. causal relations: 'X causes Y', 'X enables Y', 'X impedes Y', …
> e. modal notions: 'X is hypothetical/nonspecific/potential/fictional…'
> f. social notions: 'X is the name of Y', 'X is dominant to Y', 'X is kin to/friend of Y', 'X is member of group Z', 'X owns Y', 'X is obligated to perform act Y', 'action Y is of normative value to X'…
> g. theory of mind notions: 'X believes Y', 'X imagines Y', 'X intends Y', 'X is committed to norm Y'… (Jackendoff 2015: 604)

The incorporation of both of these combinatorial sub-systems into Conceptual Semantics leads to a comprehensive theory of central cognition that aims to explain how humans use the available information in their minds to "[understand] utterances, [connect] them to perceptual evidence, and [make] inferences" (Jackendoff 2015: 602). As for the effects of introducing this theory of Conceptual Semantics, we can list the lack of division between linguistic and

encyclopedic meaning—which in turn implies a lack of (strong) division between semantics and pragmatics—as well as the need to accept a rich ontology of concepts obtainable by humans.

3. Framework Bias: Exemplified

In a 2002 article *The Faculty of Language: What Is It, Who Has It, and How Did It Evolve?*, Hauser, Chomsky, and Fitch proposed a view on the evolution of the language faculty that is framed by the Minimalist program. Seeking rigor, the authors propose a taxonomic and methodological distinction between the faculty of language in a broad sense (FLB) and the faculty of language in a narrow sense (FLN). This distinction is tightly connected with the theoretical framework of MP, as FLN is defined as "the abstract linguistic computational system alone, independent of the other systems with which it interacts and interfaces" (Hauser et al. 2002: 1571). The authors hypothesize that this FLN is syntactic recursion, which is central to the combinatorial system of language as seen in MP. We have already seen that in proposing Simpler Syntax, Jackendoff will disagree with this hypothesis.

When discussing the issues mentioned above regarding language evolution, Hauser, Chomsky, and Fitch (2002) focus on placing the evolution of FLN in between the mentioned parameters. They speculate that FLN—basically syntactic recursion—is uniquely human and specialized for language. Their proposal for the '*what for*' part of the question is that language has actually evolved for internal thought organization and computation, and not necessarily for communication. The argument here is that language is too complex and perfect a system to have evolved for communication, which, according to the authors, did not represent a strong enough evolutionary pressure:

> communicative needs would not have provided any great selective pressure to produce a system such as language, with its crucial relation to development of abstract or productive thinking, through its unique property of allowing infinite combinations of symbols and therefore mental creation of possible worlds (Fitch et al. 2005: 188).

As for the saltational versus gradual debate, the authors propose a saltational evolution for FLN. The hypothesis is that the cognitive module for language evolved spontaneously in at least two co-living individuals who developed articulated language, and therefore have had a great evolutionary advantage over their peers, managing to perpetuate the language ability further.

The evidence that the authors seek involve animal studies for synchrony and inferential methodologies for diachrony, based on the comparative method. A few examples are studies on the acquisition of songs in songbirds, similar to the acquisition of language in children; studies on the articulatory apparatus and capacity for sensory perception in primates that point to a universality of physical mechanisms; or research that seeks to match conceptual and expressive capacities in humans and primates. To support their claim of recursion as central to language and unique to humans, Hauser et al. (2002) point to research showing the lack of an open-ended generative capability in chimps and primates, evidenced by the slow pace and rather limited rate of adopting number representation and rule learning, as opposed to the ease that human children demonstrate based on their recursive capacity.

Contrastively—and as anticipated—the proposal based on PA as a theoretical framework differs substantially. In a 2005 response to the 2002 article, Pinker and Jackendoff critically discuss Hauser et al. (2002)'s proposals and methodology. Although the authors agree with some aspects including that a terminological distinction is needed, they do not agree with the hypothesis that only syntactic recursion is part of FLN and therefore uniquely human, or uniquely specific to language. In Pinker and Jackendoff (2005)'s selection of evidence, studies on the visual system of humans will show that recursion is present in human visual cognition.

According to the authors, the juxtaposition of the hypothesis regarding recursion as FLN and the MP with the selected evidence is a circular account. When removing the explanatory strain placed on syntax, Pinker and Jackendoff (2005) look for different evidence, including specific accounts for phonology and morphology. For them, language is not an elegant but unusable design, it is useful, though redundant, like most biological systems, and seems to have evolved primarily for communication. This aligns with evidence from other studies, such as evidence from chimpanzee behavior[3], from pidgins, or invented languages. For the other issue, language is argued to have evolved gradually, idea supported by evidence from speech recognition: the difference between the effortless development of the speech perception apparatus in humans compared to primates seems to reflect a difference in complexity, not kind.

[3] Example: *The Cognitive-Tradeoff Hypothesis*. According to this hypothesis, the last common ancestors of chimpanzees and humans (CHLCAs) were living in trees until one point when the group split, and one part stayed in the trees, while the others went into the open field. Those who stayed in the trees continued to adapt to that environment, developing extremely accurate short-term memory, while those who advanced into the field needed to communicate and work together to survive, to refer to predators and prey, to educate one another, and to plan. For this, they developed language. See Tetsuro Matsuzawa's work on cognitive development in chimpanzees (2007).

The alternative for MP as a framework is PA, which stresses the interfaces between different modules, and makes way for another hypothesis:

> The Parallel Architecture also offers an attractive vehicle for discussion of the evolution of the language capacity. It begins with the premise that some version of Conceptual Structure is present in apes, and therefore in our hominid ancestors. Bickerton (1990) and Givon (1979) have proposed that, prior to the development of modern language, there was a stage of "protolanguage", which persists in the human language capacity and emerges in situations such as pidgins and agrammatic aphasia. (Jackendoff 2015: 613)

This hypothesis sees language as having evolved from a primitive stage of raw Conceptual Structure interfaced with phonological manifestation. Syntax then—as perceived in Simpler Syntax—is an evolutionary add-on, which appeared later in order to respond to various needs. Being more complex and abstract in nature, it fits the program to regard syntax as a later development, whereas the core level of the cognitive center represents a primary component adapted for language.

In terms of evidence, Pinker and Jackendoff (2005) point to studies related to the perception of speech and non-speech sounds, as well as vocal imitation in birds and dolphins, research mentioned in the 2002 study as well. Another study brought to the table by the authors regards the research of the FOXP2 gene and the impairments that appear when slight mutations of the gene emerge. Pinker and Jackendoff (2005) interpret the findings differently than Hauser, Chomsky, and Fitch (2002), in light of other aspects that underlie language production and manifestation rather than recursion.

The two conclusions the 2002 and the 2005 studies reach are noticeably different, and although discussing the same issue, the way in which the language faculty is conceptualized changes the type of evidence that researchers seek, or even the interpretation of the same evidence. The present paper is not meant to present one line of research as superior to another, but simply to raise the question of the degree to which a chosen theoretical framework will influence the development of a study or even a review. I hope that through the exposition provided above, one can notice the framework bias that occurs and its impact over the conclusions reached by the two studies.

4. Conclusions

The present paper argued for the consideration of framework bias as a type of error that can be made from the incipient stages of a study. This idea does not do away with theoretical frameworks, which are crucial in our analysis

of the data and understanding of an issue. However, there is merit in exercising caution when designing an experiment and determining the type of data to look for and the sources for data gathering. The examples presented above showcase this in terms of the type of argumentation selected for solving taxonomic issues in a common area. A proper taxonomy needs to hold outside the theoretical framework in which it is proposed, and therefore it is one of the items frequently subject to framework bias. The goal of this paper was to signal the presence of such possibilities, and to encourage researchers to be aware of the limitations that are intrinsic to each theoretical framework in a field of study that is as novel and dynamic as linguistics.

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