Cutting the theory down to size: an essay on eliminative Minimalism

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1. Introduction

This paper is about intersecting planes. We will argue, in consonance with the theory exposed at length in Krivochen (2011; 2013a, b) and Krivochen & Kosta (2013), that "language", not only as a formal entity but also as a biologically (and thus, physically) based system, is nothing more and nothing less than the *intersection* of three systems, each of which has independent existence and takes part in independent cognitive / computational processes. The systems we will consider are the well-known *syntax*, *semantics* and *phonology*, which we will analyze in a novel manner: rather than brought together by an undefined "rewiring" of the brain (see Hauser, Chomsky & Fitch, 2002; Chomsky, 2005, among others), we will follow and hopefully advance recent research (e.g., Uriagereka, 2012) claiming that "language" is better defined as the resolution between a fundamental tension that arises in the intersection between these systems: in our terms, unlimited capacity of discrete object manipulation and combination in *n* dimensions, and limited possibilities to (phonologically) materialize the symbolic structures so built due to the finiteness of the lexicon of any natural language NL at any historical moment T (that is, productivity in lexical structures is a *historical potentiality*) and any derivational point D; and the limitation of the computational power of the phonological channel to Markovian structures (see Idsardi & Raimy, in press; Uriagereka, 2012, among others). In doing so, we will also critically analyze the concepts of UG and Faculty of Language, and their place in a strongly eliminative theory.

2. Perfection and Innateness

The term "biolinguistics" was coined, according to Chomsky (2005), by Massimo Piatelli-Palmarini in 1974, under the influence of Lennenberg's recent (1967) Biological Foundations of Language. At that time, however, it was not clear whether we were in presence of a sub-branch of linguistics or a field on its own right. It was also not clear what its scope, aims and methodology were: one of the founding questions, very much alive today, was whether principles that appear unique to language are in fact shared by other cognitive domains, and if so, in which manner. This also led to ask to which extent we can find a principled explanation for emergent properties of language as a state of the speaker's mind, ultimately, a "property of matter" in Darwin's terms.

This inquiry has led to the so-called "Minimalist Program", in the methodological and substantive effort to simplify not only the theoretical apparatus (methodological minimalism) but also the extra-theoretical entities that are to be accounted for (ontological minimalism), including elements in representations and steps in derivations. Whether the enterprise has been successful is still to be discussed (and not just assumed), but there is a wider question in hand, which has been systematically wiped under the rug in most of the vast recent literature on the topic (see, for

example, Di Sciullo & Boeckx, 2011; Di Sciullo, 2012; Chomsky, 2005, 2007, 2010; Boeckx, 2010), namely: is the principled explanation of linguistic phenomena to be found in biology? The aforementioned authors, with different degrees of convincement, seem to think so. This belief, which is actually an axiom of the theory, implies a whole view of the natural world and its foundations (even if the scope of the works under the label "biolinguistics" are usually much narrower) which is, needless to say, not innocent.

Our alternative proposal does not seek to either prove or refute the substantive Minimalist thesis that *the faculty of language is a perfect solution to interface requirements* (Chomsky, 2000: 93; Brody, 2003, Chapter 7, among many others), the main theoretical challenge that the Minimalist Program has set itself, because of two main reasons:

- As we already said, we explicitly argue that there is no "language faculty" outside the dynamic *intersection* of the three systems mentioned above (thus, there is no faculty to claim perfection about). In a tension-resolution scenario like the one we are proposing here, there is no necessity to appeal to a specific mental organ, with all concomitant stipulations and indefinitions[1], to account for linguistic phenomena or mental computations. The characterization of language perfection, moreover, includes an essential concept to be defined: the Faculty of Language, an apparently innate device to creatively produce and comprehend infinite sentences in a natural language NL. To the very best of our knowledge, there is no consensus about this fundamental notion, not even about the "innate" part:

> (…) *criticism of a largely unspecified position, with no defense of it on the part of those who are alleged to hold it but who in fact do not see what the issue is. Examples include the "**innateness hypothesis**," "autonomy of syntax," and "formalist" approaches.* (Chomsky, 2000: 142, fn. 22. Our highlighting)

However, seven years later, not only Chomsky himself, but also close collaborators, expand on the very same "hypothesis" Chomsky categorically rejects:

> *Traditional grammars and dictionaries tacitly appeal to the understanding of the reader, either knowledge of the language in question or the **shared innate linguistic capacity**, or commonly both. But for the study of language as part of biology [i.e., biolinguistics], **it is precisely that presupposed understanding that is the topic of investigation***. (Chomsky, 2007: 14. Our highlighting)

> *Cedric Boeckx provides a wonderful, modern review of the **necessity of mentalism, of innate structure for all of the mind**, and the role of mathematics in articulating different principles of representation for different modules of mind: **a summary of the Chomskyan revolution over the last half century***. (Tom Roeper, praise to Boeckx, 2010. Our highlighting)

> *Chomsky's points turned on several themes that have since **characterized his approach to language**:*
> […] *The ability to make linguistic sense of stimuli, to distinguish "news" from "noise," amounts to handling the stimulus (information) in highly specific ways, which a domain-*

[1] Among which we count Universal Grammar, Principles (and Parameters), *ad hoc* operations, among others.

> *general, and species-general theory of learning cannot even begin to account for. **The organism must somehow be equipped with an innate disposition to learn from the environment**, to pick out (independently of reinforcement) the relevant aspects of the stimuli. It won't do to treat the organism as a blank slate.* (Boeckx, 2010: 17. Our highlighting)

The reader should consider the fact that this view is approved by Chomsky himself, who writes:

> *If I were teaching undergraduate or graduate courses in these areas, I cannot think of a competing text that I would prefer.* (praise to Boeckx, 2010)

The indefinition of an essential concept for the enterprise, and the lack of consensus within the hard core of the field, leaves us with, at least, a sense of confusion.

- As a second, more technical point, and echoing the criticism exposed in Culicover & Jackendoff (2005: 89),

> "(…) [T]*here is little if any empirical evidence to suggest that language is a perfect system. The fact that it is a biological system also weighs against this view. Therefore, the Minimalist Program has been launched as an attempt to discover a way in which language can be construed as a perfect system, in spite of the prior indications that it is not*."

we find the claim that language, or, better put, *syntax*, is a "perfect system" is, at least, vacuous (if not plainly wrong, see Kinsella, 2009 for discussion). It is an assumption that has had little or no impact at all in empirical research, while filling whole books with suppositions circularily supported by Minimalist claims. The case of feature-implemented movement is a classic at this respect: "*language is a perfect system. Perfect systems do not display displacement phenomena. If language does, being perfect, it is because there is some additional requirement. Language also shows uninterpretable features. They do not appear in perfect systems either. Therefore, there is a linkage between both features of natural language, such that movement is implemented to eliminate uninterpretable features*". This logic, to be found in Chomsky, (1999: 3, 2000: 120, among other writings) and in textbooks like Hornstein, Nunes & Grohmann (2005, Chapter 9), is the foundational *non sequitur* of the Minimalist epistemology. We could overlook some of these facts if the empirical progress from the GB model to this day had been so great that intra-theoretical stipulations are of little importance. However, there is virtually no empirical or theoretical topic whose study has been demonstrated to be possible only with Minimalist methodology, as there is no clarification at all about what "minimalist methodology" actually means, apart from the Ockham's razor desideratum, not always followed. The last decade has seen the multiplication of theoretical patches[2] (*ad hoc* features, projections, operations, processes, to name but a few) while empirical coverage has remained untouched. Koster (2010: 1) puts his concern (which we shared in Krivochen & Kosta, 2013) in these words:

[2] Consider, for example, Fanselow's *Münchausen features*; Citko's *Parallel Merge*; Wurmbrand's *Reverse Agree*; Pesetsky & Torrego's *Vehicle Requirement on Merge*; Gallego's *Phase Sliding*: all these (and all those we have not mentioned, but are closely related) are theoretical complications, rather than "Minimalist questions" or parts of an eliminative Program.

> "*What follows is born out of dissatisfaction with current Minimalism, the received linguistic paradigm since Chomsky 1995. My concerns are not about Minimalism as a program. On the contrary, I subscribe to the overall goal to construct a theory that makes grammar look as perfect as possible and that relegates as much as it can to "third factor" principles. My dissatisfaction is about how this program is carried out in practice. Others disagree, but my personal feeling is that little theoretical progress has been made since the 1980s.*
> *I emphasize theoretical, because empirically speaking the progress has been impressive.* ***One can hardly think of any topic nowadays of which it cannot be said that there is a wealth of literature about it. All of this progress, I claim, is mainly "cartographic" and therefore compatible with pre-minimalist generative grammar and even certain forms of pre-generative structuralism.*** *Part of the theoretical stagnation is due to the fact that* ***some key problems of earlier versions of generative grammar****, as they arose for instance in the GB-period,* ***are either unresolved or ignored****. But there are deeper problems, it seems, that involve the very foundations of the field*." (our highlighting)

Theoretically, the MP looks very pretty (what Martin & Uriagereka, 2000 refer to as *methodological minimalism*, nothing new in science insofar as the desideratum for theoretical economy goes at least as far back as Ockham, if not Aristotle), but the empirical domain (not to mention the *implementational level* of Marr, 1981, which is virtually left aside completely in orthodox accounts) tells us that there is actually little, if anything, to *substantial minimalism* (see also Everett, 2013 for discussion about the empirical foundations of Minimalism; and Newmayer, 2003 for a critical assessment of allegedly new explanations obtained via Minimalist work; see also Koster, 2010 for a similar perspective). It is essential to point out that it is possible to conduct inquiry on the nature of language, its computational and neurological bases, and broader biological (and, in our particular case, physical) issues connected with the human capacity of producing (in the sense of *strong generation* of structural descriptions and that of *weak generation* of actual sentences, closer to Descartes' actual concern) and understanding creatively a potentially infinite number of sentences, without assuming Mainstream Generative Grammar's (MGG) theoretical machinery. In other words: the apparent "virtual conceptual necessity" of certain substantive elements and operations (e.g., features and the generative operation *Merge*) is also to be questioned and analyzed critically.

Perhaps the most salient characteristic of the orthodox biolinguistic approaches is the attempt to force concepts and patterns into the data and, from there, the architecture of the cognitive system. Notice that the reasoning is the mirror image of Carnap's (1966) model: axioms are forced into the data and there, an alleged explanation is claimed to have been found. Let us see a clear example: the notion of antisymmetry. Quite trendy since Kayne's (1994) highly influential Linear Correspondence Axiom (which maps c-command relations in 2-D tree-like X-bar theoretic representations onto phonological precedence relations), the concept has been both adopted and adapted within a biolinguistic framework. Let us confront two proposals regarding a(nti)-symmetry, namely, Jenkins' (2011) and Di Sciullo's (2011), to clarify the scenario. Jenkins claims that asymmetry is to be found at many levels in the natural world (though limiting himself to biology on both extremes, we could easily extend his perspective if we accept Uriagereka's 1998, 2002, 2012 findings on mathematical structures far beyond what biology can *empirically* test), and a plausible line of inquiry is to ask whether the asymmetry effects we see actually arise from a principled asymmetry or from an independent source. This is the key concept in Jenkins' methodology: he does not stipulate asymmetry as a principle organizing the Universe (actually, if string theory is

correct, it would be quite the opposite: the Universe would be ruled by supersymmetry), but he finds certain effects (like brain lateralization and neural wiring optimization, also following Cherniak's, 2009 non-genomic nativism) and proposes the following, as a plausible line of research:

"*Since many linguistic systems exhibit asymmetric properties one should always ask whether these may have arisen from the general principles of symmetry that we find operative in physics and the other sciences*" (Jenkins, apud Di Sciullo & Boeckx, 2011: 126)

It is strange to see that this is precisely the line of inquiry that is not only not pursued, but rejected: universality theories of the kind pursued in physics (e.g., M-theory) are systematically rejected in linguistics. Instead of integrating (some aspects of) the generative approach to syntax (which is by no means exclusive of Chomskyan linguistics, consider, for example, Systemic Functional Linguistics' "system networks" as a cognitive, on-line generator; as well as non-transformational models which are formal and explicit, the two features of a *generative* approach) on a more general scientific framework including findings from neurology, physics, and cognitive science; the road taken seems to be that of ostracism. Consider, for example, the frequent leap from linguistic considerations, often involving highly theory-specific stipulations (feature valuation mechanisms, for example) to biological considerations often involving the FOXP2 gene having little support when considering linguistic structure. So, instead of a reasoning of the form "there is asymmetry in language, language is part of nature, let us see whether asymmetry can be subsumed to more general properties of natural systems, like physical systems" (Jenkins' proposal, and our own), Di Sciullo (2011) takes the inverse, "linguisticocentric" path: "language is part of nature, then all characteristics we find in language are to be found in biological systems". In that way, we go from the necessity to eliminate uninterpretable/unvalued features [*u*-F] from representations driving the syntactic derivation to an attempt to justify the feature valuation process (stipulated in Chomsky, 1998 as a way of getting rid of the problem of the property of displacement in natural languages) from a biological point of view. Feature valuation (the process via which dimensions are mapped onto values in local relations to features –i.e., valued dimensions-) is at the very heart of the system, and asymmetry follows from the fact that there is a local relation between two instances of a feature, one valued and one unvalued, at structurally related positions in a tree representation. That pervasive system is implemented at all levels of morphosyntax. Should this approach be correct, however, the system of variation exposed by Di Sciullo would be very elegant and parsimonious, although its biological plausibility (i.e., how do we understand biologically the nature of an [*u*-V] –unvalued categorial verb- or [*u*-D] –unvalued categorial nominal- feature? What, if any, are their neurological bases? Is there any difference that can be seen in an fMRI, for example?) would still need further clarification, not to be taken on faith. Merge, Agree, Transfer, etc. are part of the formal vocabulary of linguistics, not of biology. If biolinguistics is conceived of as the *techné* of shifting fields while maintaining terms, then the whole enterprise is doomed to failure on methodological grounds.

Kayne (2011) follows the same path as Di Sciullo, and they both rely on Chomsky's notion of a "third factor" in language design, which has remained undefined since Chomsky (2005b). Non-specific properties of a computational system could follow from deep biological principles, but they can also have arisen as a result of more fundamental physical constraints, or as the optimal resolution of a generation/implementation tension (as in Uriagereka's 2012 CLASH model). The

working hypothesis for Kayne is that anti-symmetry is a human-specific characteristic. Let us bear in mind that the concept of anti-symmetric relation as introduced in Kayne (1994) was applied to phrase structure, more specifically, to the concept of c-command with linearization purposes. A general definition of anti-symmetry would be as follows:

A relation between A and B is anti-symmetric iff it holds for A → B but not for B→ A

This formulation rules out the possibility of having "mirror" trees (i.e., tree representations that are mirror images of each other), and gives major importance to the "side" of the tree in which an element appears, in the line of what Di Sciullo (2011) has posited for Merge. The tree diagram is, then, more than a model, it becomes more a(n allegedly) substantively correct representation of mental content and process. This is a claim that underlies Kayne's work, and one that might undermine its biological plausibility, as it is highly unlikely that humans actually have bi-dimensional trees in their minds to be materialized via a uniform *c-command-onto-precedence* mapping, mainly because of processing issues (consider first the hundred step rule that applies to linear Turing-like generators, or Markovian processes, and then the whole amount of operations the human brain –at most, a PDA+ automaton, when it comes to linguistic processing, see Uriagereka, 2012- must coordinate in less than a second). Our point here is that we should not assume a strong *regularity* thesis instead of a strong *universality* thesis: the first claims all systems are the same in all respects, the second, that there are underlying generation patterns which configure the deep structure of the Universe, with a range of variation allowed by physical laws at several levels of matter organization.

What will we propose, then? A novel way of analyzing language, putting orthodox (substantive) Minimalist assumptions to test. We will review a series of axioms and then briefly focus on the observational consequences they have. Reasons of space prevent us from going into detail here, but we refer the reader to our references for empirical analysis derived from the assumptions presented here.

3. Natural Language without the Language Faculty?

As should be obvious from the extracts above, there is a crucial innate element in so-called *biolinguistics* (Chomsky, 2005; Jenkins, 2000): a domain specific, evolutionarily crafted mental organ referred to as the Language Faculty (Chomsky, 1981, 1986, 1995, 2005, 2007, for the mainstream ideas). The Language Faculty (which Chomsky, 2005: 2 equates to mammalian vision and insect navigation, for both of which there is actual empirical evidence) is specific, insofar as it deals only with natural language, and although its "content" has varied with the models (from a base component and a set of transformational rules to an interplay of principles and parameters plus a set of structure building and mapping rules), there is a hard core that has remain more or less intact: this faculty, in its initial state, comprises the possible characteristics of learnable languages, and matures in contact with external linguistic data thus getting to a final, relatively stable state corresponding to the grammar of a particular language (see, e.g., Chomsky, 1965: 24-25; 1986: xviii, 3; 2007: 1). The theory of the initial state is referred to as Universal Grammar (UG), and has been the center of heated debate over the years. In 2002, there was an attempt to somehow clarify the content of the Language Faculty, due to Hauser, Chomsky & Fitch (2002; HCF hitherto), who

distinguished two levels of analysis (2002: 1570), in turn corresponding to allegedly core and peripheral properties of natural language:

1) Faculty of Language in the Narrow Sense (= recursion, the generative engine)
2) Faculty of Language in the Broad Sense (= external, interpretative performance systems)

External performance systems include both the Conceptual-Intentional system, in charge of semantic interpretation (including the theta system, quantifier scope, and possibly binding); and the Articulatory-Perceptual system, dealing with phonological issues, in both the stages of articulation and perception. Being external to the core of the faculty of language, these systems are not defined properly (in the article of anywhere else in mainstream Minimalist literature), nor is there a biological / cognitive theory of these components, other than theories of their interface with the Narrow Syntax, that is, FLN. These interfaces include (following MGG's characterization of language as "*an optimal solution to conditions that it* [language] *must satisfy to be usable at all*", according to Chomsky, 2005: 10) the levels of Logical Form and Phonological Form, each of which imposes conditions over output representations (so-called "bare output conditions") handled over by the "narrow syntax".

With respect to the FLN, that is, recursion, HCF claim:

> "*FLN is the abstract* ***linguistic computational system alone****, independent of the other systems with which it interacts and interfaces*.[…] *We assume, putting aside the precise mechanisms, that a key component of FLN is a computational system (narrow syntax) that generates internal representations and maps them into the sensory-motor interface by the phonological system, and into the conceptual-intentional interface by the (formal) semantic system* […] *All approaches agree that a core property of FLN is recursion, attributed to narrow syntax in the conception just outlined."* (2002: 1571. Our highlighting)

We will not deal here with the problem of the lack of a proper formal and fully explicit definition of *recursion* (a fact that triggered the Pirahã debate, see Rojas-Berscia, 2011 for a summary), and the subsequent lack of clarification about the syntax of, for instance, *iteration* (but see Lasnik, 2011, and Uriagereka, 2008, for a Markovian proposal), not to mention much more basic issues, like the nature of phrase structure itself; which, relevant though they are, fall outside the scope of the present paper. We would like to link the fragment above, which summarizes a whole architecture of the so-called "language faculty" with the fragments in section (1), which deal with the innateness hypothesis. At this respect, the question we would like to posit is twofold:

3) a. What does "innateness" exactly mean and imply?
   b. Is innateness an axiom, a theorem, or a conclusion?

We will begin the next section by proposing our own answer to (3 a), insofar as we consider MGG has not provided a satisfactory answer to this day. In doing so, we will also tackle the second question in a more specific form for language, which would be paraphraseable as (3 c)

> c. Is the Faculty of Language (FLN/FLB) a *necessary* and *sufficient* condition to account for natural language phenomena?

To our understanding, these questions are of great importance for the epistemological foundations of biolinguistic studies, and should therefore be addressed with the utmost care. Reasons of space prevent us from going deeper in this piece, but we will summarize the argument we have developed in previous works.

4. Two interpretations of innateness:

Departing from the analysis of the fragments in Section 1 (and in order to begin answering the questions posited above), we will distinguish two versions of the innateness thesis, which we have called "weak" and "strong" versions:

a. *Weak innateness* (WI): at least one of the components of FLB has an innate, non-acquired initial state, determined by the genome.

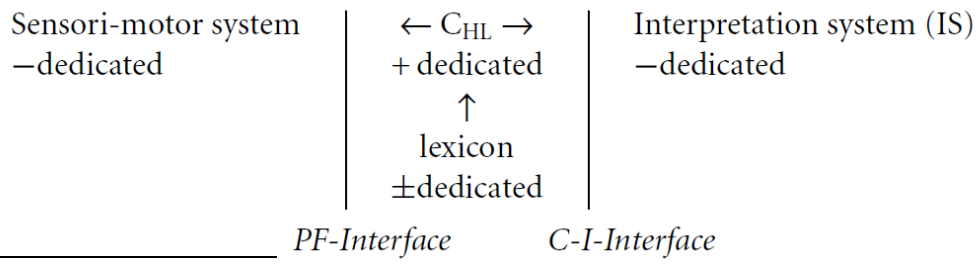
This thesis, to the best of our understanding, is trivial, insofar as it tells us nothing about language (or any of the systems involved): if a certain mental faculty has neurological basis, it will be indirectly determined by the genome, as triplets of nucleotides encode instructions to synthesize proteins, the bricks with which the brain is built. If computational properties are somehow determined (limited and licensed) by physical laws in turn ruling the possibilities of neural connections (see, for instance, Hopfield, 1982) then the triviality of WI follows, the non-obvious relation between computability and physical laws notwithstanding. Of course, unless we distinguish mind from body in a platonic way, any mental entity will have neurological correlation, which makes WI, as it is now, scientifically uninteresting[3]. There is, to give but an example, compelling evidence in favor of neurological bases for conceptual structures (Taylor et. al., 2011), but this tells us nothing about their specificity, function, structure, etc. The WI, in our opinion, includes genotype – phenotype dynamics, as it deals with broader biological concerns and does not make FL a *sine qua non* condition for biological-physical studies of language development and processing. In this sense, the research on the impact of FOXP2 in language development (see Piatelli-Palmarini & Uriagereka, 2011 for an overview); the possibility of finding mathematical regularities within linguistic (and, more widely, symbolic) structures (e.g., Jenkins, 2011; Uriagereka, 1998, 2012; Medeiros, 2013, among many others) would fall within WI. These latter perspectives, however, are not currently on the spot, but see Krivochen & Kosta (2013) for an attempt to present a physically based model (Radical Minimalism, Krivochen, 2011, 2013a, b) and apply it to displacement phenomena (also dealt with, in more detail, in Kosta & Krivochen, in press; Krivochen, forthcoming) and the nature and ontology of so-called Empty Categories.

b. *Strong innateness* (SI): FLN is both language-(and species)specific and innate (HCF, 2002: 1573)

[3] However, this could change if the approach known as "physics of language" continues to evolve. In short, biology alone cannot make WI non-trivial, but we can ask ourselves which physical laws determine the properties of cognitive systems, and to what extent computational properties can be predicted from those physical laws, predictions that can be empirically tested. Unfortunately, this approach is still minority. We thank J. Douglas Saddy and Juan Uriagereka for insightful discussion about this specific point.

This is the most extended version of the innateness thesis, as we can see in the fragments in section 1. Despite its popularity and its central place in the very core of MGG (as the violent reactions towards Everett's 2007 claims attest) there are both conceptual and empirical problems with this thesis, which make it untenable from our point of view. Conceptually, if FLN = recursion, it is clearly not language-specific (as studies in the capacities of music –Jackendoff & Lerdahl, 2006-, mathematics –Leung, 2010 for a language-related view-, among others, attest; not to mention conceptual structures, which are clearly non-linguistic –Taylor et. al., 2011-). Even if recursion, however defined, could still be innate, the claim for language-specificity (which can be seen in the highlight above in HCF article) is falsified by the aforementioned references to hierarchical structure in non-linguistic systems. Let us review some arguments in favor of the so-called *conceptualist stance*, which are central to the claims of biolinguistics.

Reuland (2011: 202), from the core of generative linguistics, attributes the recent interest on language evolution on the advent of the Minimalist Program, and its assumptions. He argues that there are two defining characteristics of UG: unboundness (i.e., recursion[4]) and "desymbolization" (i.e., dissociation of form and function). The reasoning is as follows: if there is UG, there is unboundness and desymbolization. Language displays both characteristics, therefore, there is UG (and, therefore, FL). The logical structure is fallacious insofar as it affirms the consequent in a syllogistic structure. It may very well be the case that language, whose nature and ontology is left mysterious in this account, displays the aforementioned characteristics as a result of recombination of non-specific components, what Reuland calls "- dedicated" components. In his account, Merge (that is, $C_{(HL)}$ that guarantees infinite use of finite media) is "+ dedicated", as it is language-specific. And, it is language-specific because it is "+ dedicated". Nothing informative here, unless we can prove that there is no element outside language that displays characteristics that could only have been generated via Merge. Reuland's schema, following Hauser, Chomsky & Fitch (2002), among others; is as follows (2009: 206):



[4] The sole concept of recursion in linguistics, and the misunderstandings it has generated, would deserve a full book. However, let us point out that the architectural theses focusing on the recursive engine frequently overlook data in favor of theoretical stipulations. The recent article by Watumull et. al. (2014) loquaciously expresses the underlying assumptions with respect to empirical threats (like the one proposed, e.g., by Everett's, 2005 claims about Pirahã lacking phrasal recursion; or the non-recursive nature of some portions of the English language, like adjuncts, see, e.g., Uriagereka, 2005): "*To the extent that embedding is a sufficient, though not necessary, diagnostic of recursion, it has not been established that the apparent restriction on embedding in some languages is of any theoretical import.*" (Watumull et. al., 2014: 1).

Unboundedness is guaranteed, in his model, by the fact that $C_{(HL)}$ is marked as + dedicated, comprising *Merge* and *Agree* (a claim shared by Hauser, Chomsky & Fitch, 2002 for Merge). Let us consider each in turn. It has been already suggested (see, for example, Uriagereka, 1998; Jackendoff, 2002) that hierarchy is relevant in the organization of the sensorial information, for example, when distinguishing a figure from a ground in the visual apprehension of the world. Hierarchy in language is created by Merge; assuming that hierarchy in other systems is created by some other operation would be multiplying theoretical elements beyond necessity: the so-called "essential properties" of Merge, combination of two elements and labeling of the resulting structure for the purposes of further computations (Reuland, 2009: 206-207) are actually epiphenomenal. It would take a special stipulation to restrict the power of the generative algorithm to binary structures (stipulations derived from the LCA or Binding Theory, in most cases, see Kayne, 1984, 1994), should we attempt to impoverish FL to get only the essential, binarity would certainly not be in this set. Two different answers have been proposed: either syntactic structure is not necessarily binary (see, for example, Culicover & Jackendoff's, 2005 *flat structure*; or finite-state proposals for adjunction, as in Uriagereka, 2005, 2012) or it is indeed binary, but as a result of interface requirements, particularly semantic conditions on interpretation in a derivational system driven by the need to combine conceptual information (roots) and instructions as to how to manipulate that information, particularly restricting reference (procedural nodes, in Relevance Theoretic terms, Sperber & Wilson, 1995; Krivochen, 2012). Even if both these alternatives were proven wrong, the mere possibility that alternative formal systems can be built without the *axiom* of binarity, either because *n*-ary structures are allowed (*flat structure*) or because it is not an *axiom* but a *theorem*, generating no inconsistency is itself an argument against its essential character. The proposal of Radical Minimalism (also shared with other approaches like Jackendoff's Conceptual Structures, Survive Minimalism's architecture, and Uriagereka's CLASH model) is that Merge can be better expressed as an *n*-ary *concatenation* function applying in an *n*-dimensional workspace, all constraints (including binarity when existent, see Krivochen, 2011, 2012) being determined by interface conditions over interpretation: finite-state and "recursive" (in the Chomskyan sense, phrase-structural / self-containing / embedding) constructions co-exist in linguistic expressions. Thus, conceptual structures (of the kind Moss et. al., 2007; Taylor, et. al. 2011 describe) are hypothesized to be built via Merge applying to concepts in (say) a 3-D mental workspace, which represents the phenomenological world that is to be "understood" and somehow projected in the mind, using Jackendoff's terminology. Phonological structure (i.e., linearized phrase markers), in turn, is possibly Markovian in its computational nature (see Idsardi & Raimy, in press, for discussion), the elements manipulated being discrete; something particularly noticeable in music (conceptual structure being arguably absent), where we have a finite set of elements with which we can generate infinite structures. Variation also arises, like in language, not because of the generator function but because of the characteristics of the "lexicon": in this case, the occidental system based on 100 cents difference between two immediately adjacent notes of a chromatic scale and the oriental system, with a threshold of 50 cents. It is not absurd to visualize that the possibilities of combination that arise in one system and the other are comparable to, say, the possibility of incorporating manner into motion as in Germanic or not, as in Romance. The discussion itself licenses a whole book, but we consider the arguments presented here at least serve as a strong

suggestion that Merge (or, in more general terms, a combinatory engine) is not language exclusive. That leaves us just with Agree, which is in turn parasitic on the notion of feature valuation and (un)interpretability. Even if such features and valuation process actually existed and were a necessary condition for language (against which we have strongly argued in Krivochen, 2011, 2012), it does not follow that Agree itself is necessary for language, additional stipulations have to be made, namely:

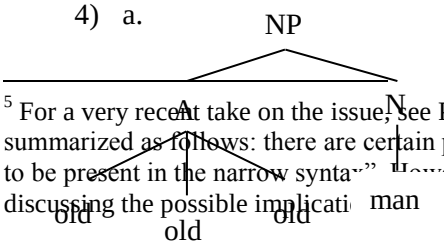
- Features come in four variants: valued-interpretable / valued-uninterpretable / unvalued-interpretable / unvalued-uninterpretable (see Pesetsky & Torrego, 2007; cf. Chomsky, 1999)

- A single feature must be present in two locations, namely, a "probe", in which it is unvalued, and a "goal", in which it is valued, locations which are related via asymmetric c-command relations. This justifies the feature value copy that makes the unvalued feature in the probe an inert element for interface purposes.

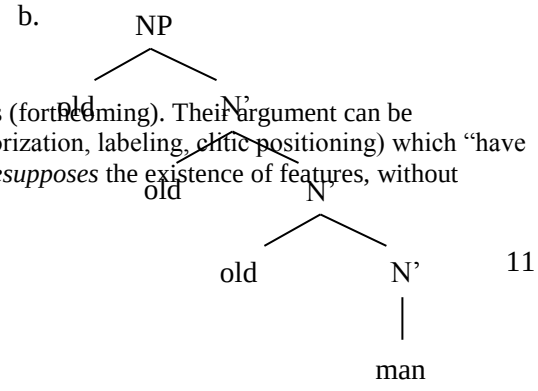
Orthodox Chomskyan linguistics is forced to make these assumptions (or equivalent) in order to have a consistent theory, but with a high cost: lots of new elements have to be introduced almost on a daily basis so as to maintain the machine working and providing "accounts" of the data. The disadvantage we find here is mostly methodological, and this is something that has been more obvious since Chomsky (1998). He claims that language has the property of displacement, which means that objects are interpreted in different places from which they phonologically appear. However, displacement is seen as an "imperfection" of the language faculty, which is not to be admitted under so-called "Minimalist" assumptions. Therefore, Chomsky introduces the concept of "uninterpretable features", another "imperfection", and links both by claiming that uninterpretable features lead elements to "move" in order to value / check those features, in short, to eliminate them from the syntactic representation. The problem is kind of solved, but, as we said, at a high cost: there is no independent reason why we should have features in the first place[5]. This is the main argument we will present here against proposals like Reuland's (2011): the fact that a property X can be accounted for via Y (for instance, recursion via FLN) means neither that Y is a necessary or a sufficient condition for X (i.e., we could have recursion without FLN), nor that Y even exists outside a theoretical framework.

An empirical argument against the language-exclusive conception of FLN goes along the lines of claiming that languages (and, more widely speaking, minds) are not *uniformly* recursive, which means that the computational engine must be underspecified enough to generate structures in different ranks within the Chomsky hierarchy *within the same derivation*: there are phrase-structural dependencies in natural language, sure, but there are also Markovian dependencies (as Lasnik, 2011 shows). Consider the following alternative structures (Markovian and phrase structural respectively) for the NP "the old, old, old man":

4) a.



b.



[5] For a very recent take on the issue, see Putnam & Fábregas (forthcoming). Their argument can be summarized as follows: there are certain phenomena (categorization, labeling, clitic positioning) which "have to be present in the narrow syntax". However, the article *presupposes* the existence of features, without discussing the possible implications of a feature-less model.

If sisterhood imposes relations of semantic scope at LF (as c-command definitions lead us to assume), then (4 b) is imposing too rich a structure for what is really a flat relation between elements, without any of them having scope over the others. A strict phrase structure model (e.g., Chomsky & Miller, 1963) is thus inadequate for some portions of English grammar (see the argument against Markovian processes in Chomsky, 1957), we have to go one step below the Chomsky Hierarchy. Notice, incidentally, that (4 a) could be generated with a Σ, F grammar, where Σ = A and F = terminal strings (lexical items) but only allowing F to be infinite (since there can be infinite instances of "old"), which is a trivial generative procedure. Formally, it would tell us nothing (as a non-trivial procedure must be restrictive enough to determine conditions of well-formation, in a Standard-Theory-like grammar), and empirically, it would overgenerate.[6]
If the generative engine is exclusively phrase-structurally based (equating phrase structure with recursion), then Markovian structures are predicted to be outside FLN (which Idsardi & Raimy notice with respect to linearization requirements, but under a completely different light, and without dismissing the possibility of having Markovian dependencies within the "narrow syntax"), but nevertheless they exist within natural languages. Therefore, FLN is inadequate as an explanatory concept and too weak as a descriptive concept. The architecture of the formal system underlying language, as well as its neurological basis, and the physical laws that license certain matter configurations, must be deeply revisited. This, we take to be the challenge for so-called "linguistic engineering" (Rojas-Berscia, forthcoming) in the years to come. In the following section we will present a brief summary of the Radically Minimalist approach to the aforementioned architecture.

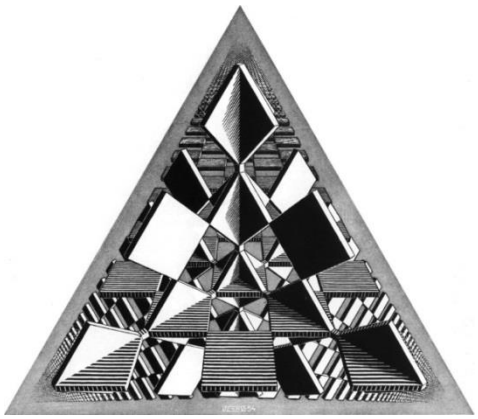
5. "Ok, so no FL. What then?"

That is probably a question going through the reader's mind. We have claimed that recursion is not language specific, nor is it uniform in nature; innateness should be relativized to a point in which the MGG interpretation seems hardly correct; and biolinguistics is to be re-interpreted as, and completed with, a thorough investigation about the physical laws involved in both the material and computational bases of language (see Medeiros, 2013; Uriagereka, 2012; Graben et. al., 2008 for

[6] It is to be noticed that nothing in our proposal forbids *mixed* dependencies within a single syntactic object. Thus, a friend who is very old in age, and whom I know from a long time back, can be [an [old [[old] [old] friend]]], a structure that mixes Markovian and phrase-structural dependencies.

samples of this view). What would an architecture compatible with our version of eliminative Minimalism look like? The system we propose is best illustrated as follows[7]:

5)



In this piece, there are three planes, call them A, B, and C; independent of each other and extending *ad infinitum*. The intersections involve either two or three planes, thus getting:

6) A ∩ B
A ∩ C
B ∩ C
A ∩ B ∩ C

Now, let us consider A = Conceptual-Intentional system; B = Sensory-Motor system; C = free, unbounded, and blind generative engine. In this architecture, the faculties are configured as follows:

7) A ∩ B → interjections (see Chomsky, 2008 on the lack of combinatory power of interjections, which would be explained by the absence of syntax, but their belonging to natural languages all the same)[8], animal calls (e.g., vervet monkeys, see Demers, 1988)
A ∩ C → conceptual structures (Fodor, 1970; Jackendoff, 2002; Taylor et. al., 2011; Uriagereka, 2012)
B ∩ C → music capacity (Jackendoff & Lerdahl, 2006), structured bird sing (Uriagereka, 2012: Chapter 6)
A ∩ B ∩ C → clausal grammar (including mixed computational dependencies)

That is, there is a structure-building algorithm, but those structures are neither linguistic, nor they need to be: natural language enters the scene only when:

[7] M. C. Escher (1954) "Three Intersecting Planes". Woodcut in three colors. 325 x 375 cm. Taken from J. L. Locher (ed.) (1988) *The World of M. C. Escher*. Amsterdam: Taschen. p. 210.
[8] The architecture presented here, not being syntactico-centric in the sense of Culicover & Jackendoff (2005), could be used to account for so-called "syntactic nuts" (Chapter 1, section 1.5), facts of language which are hard to accommodate for MGG, without resorting to Construction Grammar approaches. The possibility is currently under research.

a. There is *no* one-to-one relation between entities of the phenomenological world and verbal expressions

b. There are sound-meaning relations, such that phonological exponents materialize structure

c. Computational complexity can go beyond strict linearity in recursively enumerable types of dependencies

(a) is crucial, insofar as natural languages are never triggered by a stimulus-response mechanism: a human can see a snake and shout "there's a snake!", or anything else he wants, or just do nothing. Contrarily, the vervet monkey has no choice but to respond to the visual stimulus "snake" with a particular call.

This kind of "modularism" ('porous modularity', in Uriagereka's terms) does not depend on a central module, nor does it isolate components, but rather implies a highly dynamic conception of the functioning of the mind: a more complete "map" of the mind would include other very basic systems (possibly, the oldest systems in evolutionary terms, some of which are shared with superior primates, as even HCF acknowledge. Consider, for instance, the intersection of the interpreter of information coming from the phenomenological world via cones and rodes in the eye, and the generative engine, in order to generate 3-D representations and establish figure-ground relations among entities thus perceived), and a detailed description of the intersection possibilities. The predictions this system makes include the derivation of non-attested intersections from basic physical-biological laws in the form of interface constraints: admittedly still in a speculative level, it is possible that the lack of intersections between, say, cones and rodes, and the S-M system (arguably, due to the fact that the information decoded by eye cells cannot be assigned an interpretation at S-M) can be derived from more general and fundamental physical-biological constraints over neural networks corresponding to the relevant systems (see Grinrod et. al., 2013). If it is true that computational properties of the mind are licensed by neural configurations (in turn, ruled by physical principles), as we assume, then it is possible that visual information, organized in a basic hierarchical figure-ground template, is incompatible with the essentially Markovian character of the S-M system (see Idsardi & Raimy, in press; Uriagereka, 2012): each intersection displays a *tension* (technically, a *frustration*) between the systems involved, insofar as there are opposing requirements of *transduction* (specific to each system when transferring information by local chunks) and *conservation* (as a general physical law globally ruling derivations, in a way that is reminiscent of OT's *faithfulness constraints*) of information. In a local system, like the one we are proposing, this tension arises at each derivational point: if a linguistic derivation is semantically driven (see Krivochen & Kosta, 2013; Krivochen, 2013a, b), then global tendencies will favor conservation of CS information, through its linguistic interpretation, towards LF, whereas PF will try to access and Markovize local, small cycles defined by the monotonic application of Merge (or whichever algorithm we have in mind, including Unification, see Shieber, 1986; and mere Concatenation, see Krivochen & Kosta, 2013), which apparently display a finite-state behavior (Uriagereka, 2002, 2012; Krivochen, 2014). Existing systems and interfaces (as well as non-attested, but logically possible intersections) could be looked at from this new light, insofar as the explanatory potential of the dynamical model presented here (a particular instance of "linguistic engineering") relies precisely in the lack of *a priori* specificity (as in HCF's FLN): specificity in

cognition is reformulable as unique intersections (each intersection displaying a different kind of dynamical frustration according to the specific requirements of systems involved), which activate *dynamically* in the form of cognitive workspaces where operations are performed, generating symbolic representations (for language, see Baddeley, 2003) only when needed (as opposed to a static conception of the FL defended by MGG), thus leading to a better assignment of computational resources.

The inner dynamics of the linguistic system as we conceive it has a lot of points of contact with OT syntax, as the focus is set on *evaluation* and filtering, rather than *generation* of only well-formed formulae. The adopted perspective upon these two basic routines gives rise to two different types of theory:

8) a. Constructivist theories: *Given a generative system Σ, and a finite set S = {$\alpha_1 \ldots \alpha_n$} of well-formed formulae, Σ generates S and crucially* ***no*** *α such that α ∉ S.*

   b. Restrictivist theories: *given a generative system Σ and a set S of discrete units of whatever nature, Σ manipulates members of S freely and unboundedly, all constraints being determined by interface conditions.*

Interface conditions are made explicit as legibility conditions of the systems that enter an intersection relation, systems that can access the derivational workspace and *take* whatever object they can fully interpret (a dynamical approach to *cycles*, contextually defined). As we have developed in Krivochen (2011), the derivational dynamics we argue in favor of imply extremely local evaluation, that is, the interface systems "peer" into the syntactic workspace after each derivational step to check whether a fully interpretable object has been assembled, in which case the relevant object is taken by the interface system. In turn, the trigger for generation is not feature valuation (as in the system proposed in Pesetsky & Torrego, 2007), but global semantic considerations: given a certain conceptual structure CS (originated from the intersection of syntax and semantics; see Taylor et. al., 2011 for a neurocognitive approach), its linguistic instantiation must *conserve information* throughout the derivational path towards LF. Thus, instead of filters / Principles, we argue that the extremely local evaluation procedure to take into account is what we call Dynamic Full Interpretation (Krivochen & Kosta, 2013: 73):

9) *Any derivational step is justified only insofar as it increases the informational load and/or it generates an interpretable object.*

We cannot go into details here for reasons of space (we have done it in Kosta & Krivochen, 2013; in press), but notice that this formulation makes some elements assumed within MGG superfluous (for instance, intermediate landing sites for Wh-movement in outer specifiers of phase edges just for the sake of phase theory). There is still much empirical work to do, and it will be the only way to know whether, apart from its theoretical and methodological advantages (among which we count the elimination of a static FL as a *sine qua non* condition for natural language -with concomitant theoretical and empirical problems-, the case for mixed models of mental computations, and the aim to link computational possibilities with physically licensed configurations of matter, see Krivochen, 2013a, b; Marr, 1981), the eliminative program we propose under the rubric of Radical Minimalism

can account for natural language phenomena, thus becoming a consistent and explanatorily adequate theory of language.

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