RETHINKING THE LANGUAGE FACULTY

Abstract

The nature of the human language faculty is a matter of debate which has become the signature for the two mutually exclusive alternatives in modern linguistic thought, i.e. the generative/biolinguistic and the usage-based/emergentist paradigms as they represent two competing visions of language, i.e. either as a bioprogram fully specified for complex grammar , or emergent from a combination of a number of non-specific cognitive properties. The present article argues that the two positions must be treated not as alternatives but as contributing to a more realistic third alternative.

At the centre of the argument is the conceptualization of the language user, identified as the average normal human adult whose linguistic experience, or E-language, is a reflection of the individual's complex and highly structured social life and communicative interactions at a professional level, at a community level as a neighbour, a friend, a family member and as a fellow human. This is reflected in the complex nature of one's E-language, argued here to consist of a combination of three subsystems, labeled here as code-like system, inferential system and protolanguage-like or primitive/rudimentary language systems, existing in parallel in the adult mind.

Starting from these theoretical stipulations the article argues that the innate propensity for learning and processing of the very essentials of language, i.e. the most primitive language systems, is more likely to reflect the content of the innate Language Faculty, while the other two subsystems reflect the participation of a broad range of cognitive resources implicated to different degrees in language learning and use. This novel interpretation of key concepts in linguistics, i.e. the human language speaker, Language faculty, E-language, would be a valuable contribution to evolutionary linguistics in tracing the evolution of language.

Keywords : Language Faculty, protolanguage, language instinct, biolinguistics, Broca's region, language acquisition

1.Introduction : the Language Faculty, the current status quo

How is language represented in the human organism? The answer by modern linguistics is a tail of two mutually exclusive alternatives. The two dominant perspectives offer two diametrically opposed explanations. The generative perspective argues for direct representation of grammar in the form of an algorithm implemented in neuronal tissue, encapsulated in a cognitive module termed Language Faculty(LF). The grammar algorithm is said to contain highly abstract grammatical concepts and principles of organization, usable exclusively in language processing . And although the majority of generativists adopt Chomsky's models, various other models are known, some of which differ significantly from the classical proposal, e.g. Lexical-functional grammar (Bresnan, 2001), Parallel architecture (Jackendoff 2002 and elsewhere), to name a few. Moreover, although the foundational tenets of the generative approach to language as grammar and grammar as a mental organ remain unchanged, various versions of the language organ/LF have been proposed over the years (Chomsky, 1981, 1986, 1995 and elsewhere). Currently there is no universal agreement among

generative linguists on the features, functions and location of the LF.

Naturally, this theoretical plurality injects confusion and presents a challenge for experts in human biology and cognition in their empirical investigations of LF as there is no clarity on what should be the goal of their inquiries, what are they supposed to be looking for in the human brain .

The generative paradigm is a formalism, a system of concepts and principles which, although highly influential thanks to its logical consistency, is after all, an opinion of linguists on what the human brain is, how it is organized, how it functions and what makes it different form other brains. Empirical confirmation or refutation of this opinion is beyond the expertise of linguists as it is the province of life scientists for whom the postulation of innate features of great specificity and abstraction, highly unusual for any cognitive entity, presents additional challenges . So, there is tension between a formal postulation of an algorithm, encapsulating extremely complex and highly abstract concepts and rules with highly specific functions in the tissues of the human brain, on the part of linguists (biolinguists), and the so far futile efforts of neuroscientists to confirm with empirical findings the factual existence of a cognitive entity with such properties , which further complicates inquiries into its evolutionary history.

As a theoretical alternative proponents of the usage-based/emergentist approach deny any cognitive specialization for language what so ever, that is, that nothing in the cognitive organization of the brain is a priori specialized for language and specialization in neuronal connectivity emerges during language learning as a developmental process (Bybee, Beckner, 2009 among many others). In this context nothing in human biology is specifically linguistic. The unique linguistic abilities of humans are explained with the unique flexibility of the young human brain which makes possible the learning of a variety of behaviours, language being one among many others .
Thus, the debate on the issue of biological foundations of language is between two extremes: complete innate specialization vs. complete absence of specialization for grammar.
The present article argues that neither alternative is sustainable. Instead I will try to convince the readership that , to use the worn out expression " the truth is in the middle" or that each of the rival perspectives makes significant but limited contributions to the full picture, i.e. that there are innate predispositions for language but these are limited to supporting the most rudimentary forms of language, while the semantic and grammatical complexity and diversity of modern languages result from emergent specialization in brain organization under the influence of experience during language attainment.
The following segment briefly outlines the defining features of the two major opposing perspectives in this debate, the biolinguistic and the functionalist approaches, as a starting point in my argument for a new and revised understanding of the bio-cognitive representation of language.

1 .1.The Language Faculty in classical generativism : Universal grammar

The generative paradigm is based on the foundational assumption that the human organism is

innately equipped with innate body of knowledge of language, or LF, which underly all human languages , despite the apparent diversity in observable language systems. It is said to be an algorithm instantiated in the tissue of the human brain. This bio-computational approach to understanding language lead to the recent establishment of a new branch of linguistics, biolinguistics, whose research goals are to uncover the location and internal organization of LF . Its content and functions as proposed by Chomsky, Pinker, Bickerton and other prominent generativists can be summarized as follows:

a. It is a hierarchically organized system of categories, defined by their position in a hierarchy and rules governing their formation.

b. The rules rules apply only to categories within the hierarchy, not to externalized material manifestations of the structure, individual words, which are sequentially arranged either temporally (in speech) or spatially (in writing).

c. Nouns, verbs and other lexical categories are abstract entities composed of abstract features with binary values which combine to form phrasal categories, Noun Phrase,Verb phrase etc., which form phrases, substructures, organized under phrase structure rules.

d. Verbs are divided in three categories depending on the number of obligatory arguments they take to from a well-formed sentence : some take one argument, for example sleep (Paul) , others take two arguments, for example , read (Mary, book), yet others take three, for example give (Mary, book, Paul).

e. The language faculty also specifies grammatical devises for relating abstract grammatical structures to language use in communication by incorporating grammatical forms of tense, aspect, modality and relating grammatical structures to truth conditions and illocution.

f. The language faculty also specifies the rules for combining sentences into more complex structures via subordination and coordination.

g. The language faculty encodes pronouns of which there exist different types as well as specifications for licensing the use of each type . Pronouns and reflexives are in complementary distribution and are subjected to binding principles.

h. The language faculty contains rules for interpreting elements which are omitted at the surface , or ” empty categories “, that is, elements whose phonological realization is omitted but their meaning and structural position can be recovered at underlining invisible levels of structure, e.g. empty categories are traces of moved elements, the subject of a non-finite clause embedded in a finite clause.

The most resent version of the biolinguistic perspective outlined by the Minimalist Program (Chomsky 1995), although seeks to simplify the bioprogram, by proposing a single operation of recursive Merge as the only feature of the language-exclusive linguistic computations, at the same time maintains the view that the grammar of modern languages is pre-specified to great detail by innate factors. LF under the latest version of minimalism is hypothesized to produce grammars with the properties defined by the Principles and Parameters /Government and Binding approach, outlined in detail in Chomsky 2005, Hornstein 2018 among other publications as follows:

* The computation process, the building of the hierarchy starts with Merge, operation

combining two elements from the lexicon into a new entity with internal organization.

*All operations are cyclical.

*All operations are local.

*Control operates on deficient clauses which contain elements in need of proper case assignment .

* Movement is always local, upwards, structure-preserving and under C-command configuration.

* Case and agreement apply at Xo and XP, but not at X' level.

*Grammatical structures must be semantically interpretable.

*The output of each cycle of linguistic computations are fed into two interfaces, the Logical form and the Phonological form, which produce meaningful and pronounceable pieces of usable language.

Pinker and Jackendoff (2005, 2009) argue for a different , much broader content of the language algorithm which encompasses capacities for : * speech perception and production, phonology, syllable structure, * human-specific concepts , including Theory of Mind, * the lexicon, word formation, learning, use and storage, stipulating that, as syntax is predicated on the lexicon, a capacity for syntax must incorporate the lexicon.
Despite divergent opinions on the details generative linguists are unified on the presumption that the content of the language faculty is most accurately represented by the ideal speaker's innate potential for language, assuming a robot-like brain and mind, hardly comparable to real biological beings and hardly testable by their linguistic experiences.
Importantly, although, as the saying goes, much ink has been spilled in the last decades on the topic, it has been on reaffirming decades old theoretical fundamentals with no significant theoretical innovations to speak of. This in stark contrast with the huge empirical progress by neuroscience in understanding the localization and processing of language by the brain(see Friederici, 2017 for a comprehensive summary)

1. 2. The biolinguistic enterprise, a bridge between linguistic theorizing and biology?

The hallmark of the generative paradigm is defining language as a biological entity. In this context the role of the biolinguistic enterprise is meant to serve as a bridge between the traditional theory of language in terms of very specific linguistic terms, i.e.phoneme, verb, noun, morpheme, etc. and neuroscience in terms of neurons and neuronal connections with the goal to understand how linguistic forms are instantiated in brain tissue.
Nevertheless, attempts to transplant linguistic concepts directly into neuroscience has proven unsuccessful as " objects of study in theoretical linguists and neuroscience don't match." i.e. there is interface incompatibility issue (Boeckx, 2013, p.74) otherwise identified as Ontological Incommensurability Problem (Poeppel, Embick, 2005), i.e. the mismatch of primitives at the interface of cognition and biology, or " interface of mind and matter" (Poeppel, 2013, p.13).

Similarly incompatibility in conceptualization is noticed by fellow generative linguists, who point at a mismatch between the conceptualization of language in terms of artificial systems borrowing theoretical tools from Turing' s theory of computation and the functions of the brain as biological organ.
“the functional state-space in language is usually taken to be discrete or categorical. A phoneme is a *b* or a *p*, but not something in between, a syntactic category is an NP or an AP, but not something in between. By contrast, neural computation appears to be somewhat graded, a matter of degree of activation and synaptic strength.” (Jackendoff, 2002, p. 25).

Thus, there are theoretical challenges in finding common conceptual ground in defining linguistics as branch of cognitive biology.
As a result the main progress from empirical standpoint is made by identifying, by using imaging techniques, the localization of brain activation during language processing , i.e producing maps of brain activation in temporal correlation with language processing, e.g. localization of phonology, semantics, syntax (Poeppel, 2013)
That said, mapping is not an explanation.

1.2.1. What a language capacity is not: language capacity and perfection

Conceptual incongruity between generative linguistics and cognitive biology has resulted in further empirical challenges. The LF postulated by the biolinguistic perspective is defined by the idealized version of the human individual (Chomsky 1980 and elsewhere).The biolinguistic understanding of the human cognition in terms of binary features, 1s and 0s stems from its roots in artificial systems. This attempt to substitute ideals for real human brains and minds reveals the internal inconsistencies of the biolinguistic vision of language and mind (Benitez-Burraco, Boeckx, 2014; Martins et all. 2016; Bickerton, 2014). The conceptualization of “normal” as “ ideal” is misleading as deviations from the ideal, explicable with naturally occurring variations in human anatomy, physiology, cognition, are labeled as abnormalities and deficiencies. For example, a brain which fails to correctly interpret the sentence *The boy who the girl pushed was tall* , but is able to correctly interpret the sentence *The boy who pushed the girl was tall* in the context of the generative paradigm explicable by incorrect interpretation of traces , is labeled as deficient , thus, abnormal (Caplan, 2009).
Not unexpectedly, students of human biology have demonstrated that real biological bodies and minds deviate substantially from idealizations and there is nothing abnormal about that. Moreover, deficiencies in language processing do not usually result in complete language impairment. Empirical studies of human brains report reduction in the cognitive resources for syntax processing, not complete absence. As Bishop observes “even in the severely affected members of the KE family we do not see people with no syntax, we see people with impaired syntax” (Bishop 2009, p. 203). Thus, linguistic abilities cannot be measured with 1s and 0s. Moreover, Dabrowska and Street, (2006) provide empirical evidence that native speakers of English differ significantly in their ability to comprehend and judge the grammaticality of English sentences considered emblematic tests for the innate capacity for grammar and these differences correlate with the speakers' level of education.

The minimalist vision attributes also perfection to the FLN. That said, perfection is a characteristic attributable to idealizations. It is incompatible with the material world and especially with biological entities which, as products of evolution, are never perfect, only just slight improvements of previous ones. Gould (1980) describes the products of evolution, as " useful imperfections". Marcus characterizes the human mind as a product of evolution as a kluge , or " clumsy or inelegant, yet surprisingly effective solution to a problem" (Marcus, 2008) Moreover, as a general principle, perfection is a dead end which leaves no room for improvement. Perfect entities are eternal, unchangeable and absolute, thus, nothing like living organisms. Thus, biological entities and perfection are incompatible notions.

1. 2. 2. LF and the genome

The understanding of language in biological terms and of linguistics as a branch of biology inspired much speculation about the genetic foundations of linguistic abilities and the search for a language gene. Initially the FOXP2 transcription factor was pinpointed to influence human linguistic abilities (Gopnik et all. 1996).
The very idea of grammar genes was challenged as it contradicts the general principles of biological forms, i.e. in biology pleiotropy (a single gene influences multiple, often unrelated phenotypic traits) is the rule, not the exception and, as expected, it was found that " all genes expressed in language-related cortex are expressed in more than one cytoarchitectonically defined areas" and " multiple genes participate in the formation of any cognitively specialized brain area" (Fedor, et all, 2009, p. 307) . Given that, the role of individual genes in human cognition is extremely difficult to establish as the role of genetics in the formation of the phenotype is convoluted given that the formation of linguistic abilities includes the coordination of aspects of human anatomy, physiology and cognition.
The argument for a grammar gene underwent revision due to subsequent findings that FOXP2 gene is implicated in the functions of various other genes with multiple and broad -ranging phenotypic effects , including the formation of the heart, lungs, the brain. The gene was found to participate in brain development by affecting the formation of Broca's, along with various other parts of the brain unrelated to language skills (Fisher, Marcus, 2006)
The FOXP2 gene does have language-relevant phenotypic influence as it participates in the formation of brain circuits of the basal ganglia, responsible for coordination of movements, including speech, and also Broca's region, which processes syntax. A deleterious mutation of the gene results in a number of deficits causing difficulties with speech, grammar, known as Specific Language Impairment (SLI) (Vargha-Khadem and colleagues 2005) and general intelligence. Moreover, as per Fedor, Ittzes, Szathmary(2009 p. 24) some children with SLI have the normal version of FOXP2 gene, confirming that the role of individual genes in the formation of the phenotype is indirect and difficult to pinpoint.
Subsequently other genes were determined to participate in the formation of human linguistic abilities, e.g. ROBO1, ROBO2 and CNTNAP2 were determined to be implicated in language-relevant functions, among various others (Dediu, Levinson, 2018).
The study of the role of genes in the biological foundations of language and evolutionary aspects of these is a challenge given that gene influence is convoluted by temporal and spatial

variation in gene expression in different phenotypical traits and by the general lack of predictability in gene expression in the formation of the human cortex, as compared with the chimpanzee (Lamb, Jablonka, 2005; Fisher, Marcus, 2006) .
In sum, given the pervasive pleiotropy in the formation of human bodies and minds geneticists anticipate to find individual genes to have insignificant effect in the formation of the biological foundations of language (Fedor, Itzess, Szathmary 2009, p. 22). The highly complex and convoluted relationship between genes and developmental factors in cognitive and linguistic disorders is discussed by Benitez-Burraco (2016).
In addition, experts foresee the prospects of future discoveries of multiple language-relevant genes to be modifications of ancestral genes, confirming the genetic and functional continuity in language-relevant capacities with ancestral species (Fisher, Marcus 2006), an indication that the highly unusual features of human language and the highly unusual cognitive and communicative behaviour of language users is not likely to be explained in terms of individual genes or with genetic discontinuity.
Moreover, it is argued that human unusual behaviours can be explained not in genetic but in epigenetic and developmental emergent aspects of the human brain's anatomy and connectivity under the influence of experience , affording extensive capacities for learning (Sherwood et all. 2008) suggesting that not only the quest for language genes but also an attempt to draw a direct line of causation between the genome and language is a futile endeavour.

1. 2. 3. LF, universal and uniform?

Better understanding of the genome and its relation to language has also dispelled the myth that the LF is universal and uniform (Chomsky 2005 and elsewhere).
Although overall the human species display relative genetic uniformity, generally, individuals differ genetically, which is naturally reflected in phenotypic differences. There is no reason why this general principe in biology should not apply to the LF (Stromswold, 2010).
Moreover, cognitive capacities for language are inherited along with physiological abilities which display variation. Genetically based phenotypical traits like deafness, stuttering , dyslexia , etc. influence language proficiency and the members of the KE family affected by the gene mutation have cognitive as well as articulatory deficiencies (F. Vargha-Khadem, 2005). Thus, individual speakers are expected to differ in their linguistic abilities, both in competence and performance.
Moreover, various empirical studies have demonstrated that individual differences in language proficiency is the norm, not the exception. The postulation of a universal language faculty is criticized as naive and simplistic in some recent publications (Benitez-Burraco, Boeckx, 2014) which point at the emergence of diverse language faculties under environmental influences although within limited ranges. Similarly, in the study of cognitive and linguistic deficits
“ variation pervades language (and language disorders) at all levels ...However, ...variation is quite constrained”(Benitez-Burraco 2016, segment 4)
The claim for universality of a biological /cognitive entity is difficult to justify from evolutionary perspective as per evolutionary principles variation is a necessary pre-condition

for the forces of natural selection to work. Thus, there is inherent contradiction between the claim of LF as a biological organ, and the claim of its universality in rejection of the role of evolutionary principles.

1. 2. 4. LF and biological organs

The argument for apparent similarity/equivalence between LF as a cognitive organ and biological organs , e.g. heart, kidneys, eyes, etc. argued by Chomsky where he reduces cognition to biology and terms " mental" as " the organic structure of the brain" (Chomsky 2008, p.2) is unconvincing . For one, growing a kidney requires optimal nutrition, it does not involve contribution from culture , while the functioning of a grammar organ is conditioned on a priori existence of a learned lexicon in addition to exposure to linguistic experience. Nutrition is not equivalent to experience with language. Moreover, the tissues of which biological organs are made is very different from the neurons of the brain. In addition, the tissue of the kidneys differs from that of the liver or the heart, in reflection of their markedly different functions. Thus, the internal organization of the biological organs is highly specialized for their respective functions. This is why tissue from the kidneys cannot be replaced by liver tissue in a case of injury. In stark contrast, the internal organization of the brain is flexible and in cases of damage linguistic functions are relocated and assumed by some other part of the brain.
From evolutionary perspective the evolution of a biological organ, for example eyes, is easily explicable with clear survival advantages, which explains why eyes have evolved independently by convergent evolution in many species. On the other hand, Chomsky argues against evolutionary explanation of the LF and suggests that it may even be detrimental to the survival of the human organism .
From a different angle, it is a fact that many languages are fully functional without implementing in full the computational complexity of UG, as in Riau, Piraha and others show, suggesting that the putative UG is not always and not fully implemented, thus, underused, despite the significant energy cost for the brain associated with processing of grammatical functions. On the other hand, partial use of a biological organ or system is not known. This makes the argument for UG as " an organ of the body, on a par with the visual or digestive or immune system "(Chomsky, 2008, p.2) difficult to sustain. Brain and mind, biological and cognitive entities are fundamentally different.

1. 2.5. Broca's region and the language organ

Segregationist accounts traditionally focus on Broca's area in the frontal cortex and Wernicke's area in the temporal cortex in the left hemisphere as traditionally associated with processing of language. The contribution of each was understood in terms of division of labour between computation vs. comprehension or syntax in Broca's vs. meaning and lexicon in Wernicke's . That said, recent studies have revealed that this picture is two simplistic. Broca's region has a broad range of cognitive functions which prompts the term " Broca's complex" (Hagoort, 2009). It incorporates various areas each with distinct anatomical properties, integrates various types of information retrieved from memory and provides internal organization

engaged in numerous cognitive tasks, for example in music, language, praxis, etc. (Poeppel, Embick, 2005; Sherwood et all, 2008). This is achieved by continuously integrating new information as it is made available. Moreover, Broca's region has similar functions of integration of perception and motor functions essential in observation, imitation, planning, in macaques and humans (Sherwood et all. 2008). Consequently, deficits and/or damages affecting this part of the brain would impair a number of functions. Broca's complex participates in language processing by integrating phonological semantic , grammatical , extralinguistic information in the formation of individual words and their further integration into larger structures, phrases and sentences. It builds a sentence incrementally from bottom-up and adds structural complexity as new lexical and grammatical information becomes available as communication progresses . For example, in lexical words with complex morphology the semantic component in the stem becomes available before the syntactic category as grammatical morphemes are usually sequentially positioned towards the end of the word, thus contradicting Chomsky's argument for primacy of syntactic template which predicts that the grammatical information would be available a priori.
Moreover, the " mirror neurons" providing link between cognition and communication, are located in Broca's which suggests involvement not only in formation of language system but also in communication. Thus, Broca's region (Brodmann's areas 44 and 45) is found to have heterogeneous composition and functions.

1. 2. 6.The Language Faculty and language acquisition

The generative approach understands language acquisition as biological growth , i.e instinct-like , effortless, automatic and inevitable and advances the "poverty of stimulus" argument, one of the hallmarks of the biolinguistic perspective. Although labelled as " argument", i.e. a logically articulated hypothesis in need of factual support, the statement of the impoverished and defective nature of linguistic communication as input, insufficient to allow learning from experience, has been treated as a proven fact and a factual foundation to the innatist argument . At the same time the concept of " poor" vs. " rich" stimulus has never been clearly defined, not to mention that the use of adjectives implying gradience is inconsistent with the generative conception of language in terms of computational discreteness and precision.
On the other hand, empirical studies by (Tomasello 2000; Slobin 1982 ; Pulum, Scholz, 2002; Sampson, 2007 among others) present evidence that the linguistic environment is replete with examples deemed by generativists to be unavailable as stimulation for learning by experience. In short, the stimulus is quite rich and conducive to learning which explains why attaining language proficiency is inevitable. In addition, studies of infant development (Dehaene-Lambertz, 2017) show that children's exposure to language begins prenatally, as soon as their hearing capacities become developed enough to process it . Babies hear even in their sleep . So they experience plenty of exposure to linguistic communication, long before becoming participants. No other skill is as intensely practiced as language is .With so much training, it would be a miracle if they do not manage to learn the local language. Moreover, even if one accepts the premiss of insufficient exposure to language examples , Kirby and colleagues ' experiments with robots have found out that unlimited exposure is a detriment to

achieving language proficiency and limitations to language exposure actually facilitate the extraction of regularities (Smith, Kirby, Brighton 2003).
In sum, the " poverty of stimulus " argument is an unsubstantiated assumption and a shaky ground on which the generative/biolinguistic perspective has built its paradigm.
In addition, although all normal children attain adequate level of proficiency in language in a short period early in childhood, this process cannot be described as fast and effortless. Chomsky and others have argued that children become fully competent speakers at a very early age, i.e.3-4 years of age while Pinker (1994) and other students of child development argue that full language proficiency takes a lot longer, e.g. 12 years. Given that even today in many places the life expectancy of people is about 50 years, 12 years is a long time and can hardly be defined as short period. Moreover, although 4-year -olds are definitely competent communicators, it is not difficult to realize that the language proficiency of preschoolers is far from that of an adult. In addition, every parent is aware that attaining an adequate level of language proficiency is by no means an easy task for young learners whose early attempts of linguistic communication are rife with grammatical errors, some of which reflect the properties of the target language, which indicates the significant role of learning involved .
Although the term " language acquisition" is used by default by scholars some times to mean "language learning", the term " language attainment" seems more appropriate to label the process by which humans become competent language users, as it reflects the idea of accomplishment as a result of efforts.
To note, the studies on language attainment, dominating the field are based on observations of children in industrialized societies where this process happens under the influence of education and writing. To my knowledge there are no studies of language attainment in preliterate societies which suggests implicit bias from the start. This means that objective inquiries into language attainment has not even begun.
Moreover, given that individuals differ genetically, as mentioned above, these differences are reflected in language attainment. Even in learning the same language individuals apply their own strategies , reflecting individual preferences thus, giving the rise of individual language faculties as emergent from individual's interpretation of the same language input (Mueller, 2009).
On the other hand a relatively new evo-devo perspective introduces canalization and developmental plasticity and argues that despite significant variation and despite impairment , key linguistic abilities are preserved, a demonstration of the robustness of key aspects of LF (Benitez-Burraco, Boeckx, 2014).
Importantly, individual language faculties also reflect the idiosyncrasies of the language systems attained. D. Slobin (2004) demonstrates that the particularities of the local language as the target of the learning process influence the learning strategies of youngsters as well as the duration of that process. For example Turkish children are found to master Turkish grammar as early as two years of age , English speaking children, by 5 years, Hungarian children at 4-6 years as per Fedor et all. (2009 p. 310). So, there is variation at the level of the genotype, the phenotype and the linguistic environment. Nevertheless, children manage to zero in on similar language systems and become sufficiently competent language speakers. As per Studdert -Kennedy(1990) "Individuals reach the same developmental ends by different

routes and at different rates". (p. 17).
Moreover, education is a factor in attainment of language proficiency (Dabrowska, Street, 2006). See also Kidd, Donnely, M.Christiansen (2018)for a comprehensive review.
In short, LF emerges during language attainment in every individual brain in a slightly different form. That said, despite differences in cognitive potential and individual circumstances, most individuals reach a comparable level of linguistic competence which makes possible the communicative function of language.

1. 2.7. LF and recursion

The concept of recursion is fundamental in the generative paradigm. The " recursion only" hypothesis introduces a minimalist perspective in biolinguistics, first articulated by Hauser, Chomsky and Fitch (2002) where the authors argue on purely theoretical grounds for a conceptual segmentation of the innate cognitive resources for language and propose infinite recursion, i.e. self-embedding of phrases and sentences, as defining property of language and LF. Stemming from the assumption of universality of LF, serial self-embedding , or discrete infinity is assumed to be a universal property of language. The generative claim of infinity of linguistic computations relies on the assumption borrowed from Montague's well known statement that natural languages and artificial languages of logic display no significant differences relevant to the theory of language (see detailed discussion and criticism by Pullum , Skoltz, in van der Hulst, 2010, p.124).
The argument for recursion as a unique property of language is invalidated by a simple observation that recursion is pervasive in nature at large which produces things with nested components e.g. in plant species. Moreover, recursive cognition is demonstrated by a number of species. Primates demonstrate recursive structure in social cognition, e.g. baboons are capable of forming conceptual structures such as (X is mother of Y (who is mother of Z (who is mother of me))) (Seyfarth, Cheney, Bergman 2005). Recursive properties are also easily detectable in a number of human behaviours, e.g. musical compositions, visual cognition, the number system, games, social cognition, i.e. all domains of human cognition, suggesting that recursion is better defined as a property of general intelligence. Arbib (2002) explains linguistic recursion as a byproduct of increased general intelligence which allows perception and observation with increasing levels of detail and their representation as discrete hierarchies made possible by the formation of symbols and made explicit by linguistic recursion.
" the NP describing a part of an object may optionally form part of the NP describing the overall object. From this point of view, recursion in language is a corollary of the essentially recursive nature of action and perception once symbolism becomes compositional." (Arbib. Ibid.).
Mithun (2010) argues that , although recursive structures are common in most languages , they display variation both in space and in time. Some languages have abundance of nominal recursion, others show recursive morphology, while in others recursive structures are limited to expressing certain specific meanings , suggesting that linguistic recursion cannot be hardwired but a result of language change. Moreover, at least one language with syntactic

structure lacking recursion was found, e.g. Piraha spoken by a tribe in the Amazons lacks syntactic recursion, despite being a normal language in any other way and fulfilling all the functions of a language in a human society (Everett 2005) where recursive conceptual relations are expressed by sentence juxtaposition . It is reasonable to suspect that Piraha is not an exception.
Pinker and Jackendoff (2005) dispute the reduction of all the unique features which language exhibits to just one as a misrepresentation of language, demonstrating that language exhibits a whole host of unique features , e.g. the lexicon, morphology, etc. and argue that the " recursion only " hypothesis presents a mischaracterization of language as it puts the border line between language and non-language in a wrong place.
Although it is true that recursive syntax is abundant , especially in written texts in languages with long writing traditions, simple observation shows that in casual spoken dialogues, which is the universally preferred mode of linguistic communication, recursive syntax is rarely used and in general avoided. In sum, recursive syntax, identified in generative context as the defining feature of human language, is highly restricted by function and sphere of use in service of the communicative demands of modern advanced civilizations dominated by the proliferation of writing. As such it is not a universal phenomenon and its existence is better explained with the stylistic aspects of writing, i.e. cultural processes.

1. 2. 8. LF, a novel and unique entity?

In biolinguistic context LF is envisioned as a biological novelty, without parallel in life forms. As the postulation of a cognitive novelty precludes evolutionary explanation, the conceptual reinterpretation of LF, in terms of FLN and FLB, introduced by the Minimalist Program, is intended to facilitate the explanation of FLN in the context the Chaos Theory, designed to explain the formation of novel complex structures in physical matter with a snowballing effect of simple coordinated interactions(Chomsky, 2005 and elsewhere). In this context FLN is explicable in terms of a minor reorganization in the brain's connectivity resulting in significant increase in cognitive sophistication.
That said, the long-held bioliguistic argument for the uniqueness and computational specificity of LF is challenged by Longa (2013) who argues that human capacities for processing highly complex computations are neither specific to language nor a uniquely human property, but derivative from a slight but evolutionarily significant memory increase, complementing and extending much older non-human computational capacities for pattern formation.
Similarly, the argument for uniqueness of LF has been challenged most recently by Fitch (2018) and his the dendrophilia hypothesis, which states that small increase in memory capacity could open an opportunity for processing of longer sentences, including coordination, subordination and recursion. Thus, human capacities for processing complex syntax have evolved by "duplication and divergence" from pre-human cognitive finite-state computations, i.e processing of serial sequences, which were duplicated and used for processing embedded structures, making the use of syntactic recursion possible. Thus, capacity for processing complex hierarchical structures evolves by simple duplication and " stacking" of pre-existing cognitive precursors. See also Martins et all. (2016) for evo-devo perspective on biological

novelty.
In short, human ability for processing complex language is better explicable not by some evolutionary novelty, but by the integration and coordination of old properties , recycled and adapted for a new purpose. This makes it difficult to determine wether the difference between non-human and human language -capable brains is quantitative or qualitative.
Nevertheless, these findings do not challenge the fact that language is a highly unusual communication system.

2. LF emergent from experience

A defining feature of emergent systems is that they display characteristics not predictable by the individual entities in isolation. In this context opponents of the biolinguistic approach espousing a usage-based perspective argue for an an emergent LF assembled by a combination of cognitive resources with broad functions, recruited in a coordinated way to perform language-relevant tasks, by which a language faculty emerged from experience with language. A capacity for socialization (Dunbar, 2003) , joint attention (Tomasello, 2008, 2003,) , symbolization (Deacon 1997), capacity for complex imitation, (Donald, 1993, 1999) etc. are proposed. Thus, language takes advantage of " quite a heterogeneous cognitive subsystems, none of which is a language processor by design" (Deacon, 1997, p. 298).
The emergentist approach adopts the theoretical platform of the Chaos theory designed to understand the formation of novel levels of organization in inorganic matter which explains the use of concepts like synergistic effects, self-organization and emergence in reference to cognitive entities. Corning (1998) talks about language as synergistic effect where synergy refers to the effects of co-operative behaviours among various aspects of the organism. Here language as a behaviour presupposes coordination and cooperation among various cognitive capacities and , in addition, cooperation between cognitive and physiological capacities and activities. The emergence of a LF in the individual presupposes synergistic activities at multiple levels:
A. synergy among the articulatory organs for the purpose of speech production
B. synergy among cognitive capacities :
a. capacity for reference (to represent a class of objects through signs (as special case symbolic thought, symbolic representation)
b. capacity to form categories (things and actions are universal categories)
c. capacity for mind-reading, or theory of mind
d. capacity for self-monitoring, or metacognition, (Studard-Kennedy, Knight, Hurford, 1998).
e. consciousness (awareness that one's person and mind differ from others)
f. intentionality (stimulus-free initiation)
g. capacity to learn , extended memory
h. imagination, planning (or displacement: capacity to refer to distant referents, distant from here and now)
i. capacity for socialization (need for the company of conspecifics)
C. synergy between cognitive and physiological capacities for externalization of linguistic meaning and structure in speech

In addition, some scholars have argued for biological underpinnings of sign formation and learning , including linguistic signs. Rizzolatti and Arbib (1998) identified mirror neurons as biological foundations of sign systems. Bouchard (2013) has argued for biological foundations of the Saussurean sign. Moreover, Sperber and Wilson (2006) offer the Relevance Theory which states that the human mind has innate cognitive capacity for relevance, that is, it is innately wired for participation in communicative exchanges.
Synergistic interactions are purely behavioural and temporary, although when repeated for long enough give rise to more stable relationships which solidify by a process of self-organization and ultimately result in the formation of stable integrated units, i.e. emergent systems with new properties.
Thus, the emergentist perspective defines the language faculty as emergent property of the human organism resulting from the recycling and repurposing of a collection of cognitive and physiological capacities under the influence of experience with language during early language attainment by youngsters (Macwinney 1998).

2. 1.The assertion by the usage-based/functionalist/emergentist approaches that nothing in the human body is innately specified for language is challenged by empirical findings.

The rejection of any innate specialization for language is the theoretical signature of the usage-based/functionalist/emergentist approaches.

Nevertheless this theoretical stipulation is contradicted by empirical studies (Lieberman ,2000, 2006, 2007, 2008; Fitch 2010; Mac Neilage 1998) show that the physiology and the neuronal connectivity of the human supra-laryngeal vocal tract has a unique configuration adapted for speech. In fact, deaf individuals grow a vocal tract of normal size and proportions , despite being unable to use it for speech. In fact, alternative explanations for the configuration of the human vocal tract are difficult to justify. Thus, the development of speech capacities appears to be as innate as the development of the heart or any other biological organ or system in the body. Moreover, the fact that newborns demonstrate sensitivity to speech (Dehaene-Lambert 2017) strongly suggests innately predetermined propensity for speech perception. In addition, infant babbling is a developmental instinct, clearly evolved to facilitate speech.

A capacity for ostensive communication, a uniquely human aspect of theory of mind, demonstrated by pre-linguistic infants which can only be explained with their relevance to language, clearly suggests some form of innate predispositions for participation in dialogues (Donald, 1993; Tomasello, 2008; Scott-Phillips 2015). Predisposition for learning words (P.Bloom 2000) demonstrated by pre-linguistic infants suggests innate facilitation for learning a vocabulary. Most significantly, the hemisphere asymmetry and especially Broca's and Wernicke's regions in the left hemisphere, which, although involved in various other functions, in most normal individuals are the ones most intensely utilized by language-relevant functions suggesting some form of innate biases related to language processing (Liebermann, 2008; Deacon 1997).

Thus, the human organism clearly displays innate properties which are specifically linguistic,

suggesting that it has undergone some evolutionary adaptations for language, i.e. language-relevant abilities have been evolutionary targets as part of overall human speciation.

3. The search for language in the brain, state of the art

Friederici' s book Language in our brain (2017) presents in impressive detail a summary of decades of research into representation of language in the brain. The foreword by N. Chomsky clearly indicates that it is meant to reaffirm the classical generative view of language system as autonomous cognitive entity engaged in computing meaning-free multilevel linguistic formations of unbound complexity.

It has confirmed that the syntactic processing of phrasal and sentential structures in normal human adults is located in area 44 and 45(Broca's). The location of the lexicon is identified as middle temporal gyrus. These two form part of a extensive network of areas incorporating a large part of the left hemisphere. Thus, Broca's region is the location where the computations most clearly reflecting the uniqueness of language, the representation of complex meanings by highly abstract phrasal and sentential grammatical structures, i.e. most clearly identifiable with the LF. At the same time Broca's region, classically associated with grammar, is demonstrated to be involved also in phonological/phonetic representation, suggesting that its role is much broader in processing structure in general (ibid, p. 94-).
Importantly, in addition to mapping, processing streams, dorsal and ventral, in the left hemisphere are pinpointed by which different types of information is integrated.
In addition, beyond the core language system, it is demonstrated that language is processed by interconnected representations of structure, communicative application of the language system by pragmatic interpretation implicating social cognition, i.e by integration of brain topology, connectivity and processing mechanisms.
The book also made abundantly clear that the human brain is a unified whole of functionally integrated anatomically diverse neuronal assemblages, where perception, emotion, reasoning, socialization, imagination etc. are all interconnected. In this sense the representation of language in the brain is well beyond the physical location and cognitive specialization of a LF and integrates multiple processing functions in both hemispheres.
Thus, the brain's processing of language engages the brain as an integrated whole to which the author refers as “ language network”.
Its properties in the adult brain begin their formation early in childhood by initially engaging primarily the right hemisphere, most actively involved in perception of prosody and learning basic vocabulary, to gradually integrate the right hemisphere and Broca's region in processing of complex grammar, only after a decade of experience with language as it reaches adult proficiency.

Importantly, it reminds that the brain evolves as an integrated whole over millennia as the bio-cognitive signature of human speciation. This means that the argument that the computation of grammar as architectonically stable and functionally isolated from the rest of language-relevant functions is not supported by the findings the book so eloquently presents.

But , perhaps most importantly, the book contradicts a well known assertion by Chomsky that our knowledge of the inner workings of the brain is hopelessly poor which makes the search for

a LF, at least for the near future, futile.

This could explain why Chomsky and other generative linguists position their ideas of language in the field of philosophy, not science, and espouse the philosophy of Descartes and his vision of the human mind populated with innate ideas. That said, philosophical convictions are belief systems assumed to be true without argument. This status of unquestioned veracity is established by scientific findings and change with new scientific discoveries, unlike religious beliefs which are fact-free, irrefutable and eternal. Philosophy relies on science. Philosophical convictions of LF must be based on scientific findings and change with new discoveries. Philosophy of language must follow the science of language.

4. On behaviour and innateness

The generative paradigm from its inception is based on Chomsky's famous rejection of Skinner's behaviourism and his vision of human cognition as a " blank slate". Chomsky's criticism, though, leading to a complete rejection of the role of learning marks the other extreme in the misunderstanding of human mind by overstating the contribution of innate factors and disregarding the role of experience and learning. And although his views have since changed significantly, his denial of the role of behaviour as indication of innate properties has not. This informs Chomsky's conception of the LF as spatially segregated and structurally distinct inward-looking cognitive entity designed to function in isolation from the perceptual and cognitive experience of the biological body and its interaction with the external environment. In this context linguistic behaviour was deemed unreliable indication of the properties of the LF.

To remind, behaviour is the totality of observable, or detectable in some way, actions and/or reactions of a life form in a given environment, some of which are innate, others are result of interaction of innate and learned components to various degrees in various species. Thus, the relation of biology and behaviour is complex and indirect and defining this complex relationship in terms of the dichotomy innate vs. learned is oversimplification.

Moreover, in life sciences it is a truism that in all species biology and behaviour are closely interconnected and interdependent as in all species the purpose of innate traits is to guide behaviour and in this way facilitate survival. That is, the only way to detect biological and cognitive capacities is by monitoring and/or provoking their use in behaviour. From the muscles to the nervous system to the brain cells, one can detect their innate properties and internal organization through illuminating their function by triggering a behavioural response and from this infer their evolutionary raison d'etre. Thus, behaviour is the clearest indication of innate properties, biological and cognitive, in any biological form.

It is logical to deduce that the same principle applies to the role of human behaviour in understanding the innate aspects of the human organism. Following these indisputable facts of biology, I will assume without argument that language use, that is, linguistic behaviour, is the most reliable indication of the innate language-relevant propensities of the human organism. Not unexpectedly, experimental studies into the bio-cognitive representation of language confirm this general principle. Words are stored in memory as rich descriptions of individual

examples of perceptual experiences , including phonetic properties of words, where linguistic properties are combined with extralinguistic details(Port 2007). The ingredients of such representations are very concrete, e.g. the idiosyncrasies of the speaker's voice and other sensory representations. The vocal representation of a word in memory is articulation - based , not abstract feature -based.That is, words are stored in memory in the form of specific events with idiosyncratic details, not as structured combinations of abstract prototypical categories. This process is subconscious and universal. Similarly, Pulvermuhler (2005, 2018) demonstrates that linguistic forms, with both concrete and abstract meanings are stored in conjunction with perceptual experiences. The way language is processed by the human mind is not different from the way any other perceptual experiences (visual, tactile,etc.) are processed. And although the LF as per the minimalist program, is said to include only highly regular patterns, while excluding the lexicon, i.e. lexical words, irregular forms, set phrases, etc. residing in the memory, the linguistic computations are designed to rely on the existence of the lexicon as a storage of detailed descriptions of real linguistic experiences, which makes it an essential component of the computation procedure. If this is so, the argument for spatial and structural isolation of the language faculty cannot stand as the memory storage does incorporate sensory representations reflecting material reality.

Thus, interaction with reality is inherent to the very functioning of the language algorithm. In sum, the putative abstract linguistic computations in UG cannot be isolated from behaviour. In this sense it is not clear how would the difference between I-language and E-language, fundamental for the generative perspective, be verified empirically, beyond mere theoretical stipulations.

Importantly, the generative perspective does take into account linguistic behaviour, only it is biased towards the linguistic behaviour of individuals mainly from industrialized societies, where the level of literacy is very high, prompting the use of very sophisticated grammatical forms with high frequency, thought to be the closest approximation to the ideal speaker and a reflection of the Language Faculty in its purest form. Moreover, studies on pre-literate languages are done with theoretical instrumentarium designed to reflect language systems with long literary traditions.

And although one may argue that, given that at this point in history most known languages have developed writing systems and a large percentage of humans are literate, i.e. today the literate human could be taken as the typical human, one must remember that , although the first writing systems are dated at 4,500 BC (by Encyclopedia Britanica) until the invention of the printing press in the 1400s literacy was a privilege of few. Thus the mass proliferation of literacy today is atypical in historical perspective. That is, the innate propensities for language are inferred from atypical behaviour.

On the other hand, in all fields of scientific inquiry the object of study must be a typical example as instantiation of its most distinct properties. A typical example of a species is a normal adult specimen, not an anomaly. A representational example of a human liver is the liver of an adult human of what is considered average health, not that of an athlete or a cancer patient, or one deviating from the norm in some other way. An exception cannot be taken as a type and the factual foundation for the design of formalisms.

The object of study of linguistics is natural language. Given that for the most part of human

history linguistic behaviour has been exemplified by the spontaneous communicative interactions, usually in dialogues, of average normal adult humans , one must conclude that this is the typical example of natural language in use.
Given that behaviour is the best indication of cognitive abilities I argue that the spontaneous linguistic behaviour of the average adult, normal human is the best indication of the Language Faculty.

4 .1.The structure of linguistic behaviour of the normal human adult

The language system is shaped by language use in communicative interactions. These are determined by the social life of the individual speaker and his/her behaviour based on membership in a professional network, neighbourhood, family or the human species. One's social interactions are of three major types: 1. with colleagues at a professional level, 2. with friends, family, neighbours or fellow members of a community, 3. occasional interactions with strangers i.e. other humans. These types of interactions determine one's linguistic behaviour. Although at first glance the linguistic behaviour (E-language in generative terminology) of the average human adult seems unsystematic, it is clustered around these 3 types of social interactions into three types of subsystems, each organized differently in reflection of their different communicative roles . I have labeled them as follows: code-like system, inferential system, rudimentary system. In what follows I will outline the properties of each.

4. 2.1.Code-like system

*As the label indicates, it closely resembles a code: lexical items have only single literal meanings i.e.one-to-one mappings of a discrete form and a discrete meaning, homonymy, synonymy are avoided,
* Meanings of linguistic forms are stable, fixed and context-free,
* A code-like system is organized around the sentence as a basic unit according to grammatical principles with clearly defined discrete grammatical categories.

* The meaning of a sentence encodes a complete proposition. Explicit and complete mapping between semantic structure and grammar is the norm. All thematic roles in the theta grid of a verb are expressed in grammatical categories.

* The sentence is organized according to strict rules of grammaticality which assures that the message emitted by the sender is identical to the message received.

* The code-like system is self-contained, stands alone, independent of context.

* The sentence structure is highly detailed , contains multiple embedding of phrases and sentences and highly abstract grammatical forms.

* The meaning of a sentence is the sum total of the meanings of the composing words and their place in the architecture of the sentence, determined by their membership in grammatical categories.

In biolinguistic context the language faculty is a code processor.

The code language system has a very constrained and highly specific sphere of use. Not coincidentally it is often materialized by writing systems. Although these types of communication display obvious differences as they reflect the diversity of the languages and the writings systems which has given rise to it, such communication systems also display inevitably universal properties as they share the same functions: to inform by articulating with precision and detail complex ideas , to defend or rebuke arguments in various spheres of public discourse, e.g. government documents, lectures, research papers. This is why the majority of utterances are statements, externalized in speech as monologues. Code systems are used for dissemination of timeless ideas among communicators separated by space and time and therefore, removed from social and cultural idiosyncrasies of the context in both vocabulary and grammar.

And although it can be argued that the most resent versions of the generative paradigm, e.g. the minimalist approach, have incorporated examples form numerous languages and proposed theoretical machinery which accommodates a wider variety of examples of language use beyond the here described code system, the language speaker is still literate and grown up and functioning in a society defined by the influence of writing. Children are exposed to written language long before school age as parents are encouraged to read stories to their children before bed and children watch educational programs on TV channels. These examples contain multiple embedding of phrases and sentences and the grammatical devices this necessitates, identified as the hallmark of human language.

Moreover, children of working class families spend long ours in the care of educated professionals in daycare and kindergarten, which is often longer than the time spent with the patents who work long ours. Thus, although multiple embedding is rarely used by the average parent, which can be considered insufficient exposure, children receive plenty of exposure to language shaped by writing. In this sense the mind of the language user is formed under the inevitable influence of writing, argued to reflect the human language faculty.

At the same time multiple embedding is rarely used in spontaneous dialogues and virtually non-existent in primitive language systems.

Thus, my assumption that the language faculty in generative/bioinguistic context is based on the language use of the literate language user remains valid.

A clear example is the following excerpt from Maynard Smith and Szathmary's book The Origins of Life.

“ The relevance of ribozymes for the origin of life is enormous. As fist argued by Walter Gilbert, instead of existing division of labour between nuclei acids as carriers of information and protein enzymes, we can imagine a world in which RNA molecules performed both functions.” (Maynard Smith, Szathmary, 1999, p. 39)

4. 2. 2.The inferential system

The overwhelming majority of instances of language use of the normal human adult speaker, both educated and illiterate, are conducted by using the inferential system. It is systematic in its own way with the defining characteristics as follows:
* It is meaning-based, not structure-based, and exists mainly in spoken form, where intonation assumes some grammatical functions, e.g. the formation of questions without the use of question constructions, negation expressed in affirmative sentences, etc.
* Most utterances contain the most frugal use of constructions, absolutely necessary for making the message understandable, which in the context of Universal Grammar would be described as fragments of phrases and sentences. Most verbs have incomplete argument structure with only a single argument.
* When an utterance is a full sentence the order of the elements is flexible as a signal of speaker's attitude. ex. " That I can do "
* Elliptical and abbreviated forms abound.
* Expletives and formulaic expressions are frequently used.
* Omission of grammatical markers which do not contribute to meaning and have only structural values, e.g. definite and indefinite articles in English, is one of the most notable characteristics.
* Inferential systems use some elements of grammatical idiosyncrasies , e.g. markers of plurality , modality, tense , aspect , case markers in languages with detailed case systems (German , Russian, etc), only to the extent they contribute to the adequate understanding of the message.
* Although the generative perspective considers such less that full applications of Universal Grammar as deficiencies, these do not result in communication disturbances, as despite these apparent structural gaps the complete meaning of the utterance is successfully recovered from the context.
* Grammatically defective elements of unclear syntactic features, unclear morphological class and irregular phonology, or in Jackendoff's terms 'defective items' (Jackendoff 2002) , 'mm', 'wow', 'sht' also abound.
* Semantically vague words and phrases e.g.'that fellow', 'that thing', 'people' are often used.
* Small clauses, almost complete lack of embedding of phrases and sentences is the norm.

A clear example is the following dialogue, borrowed from Jackendoff, Culicover's 2005 although everybody can provide unlimited examples similar to this one .
A. I hear Harriet's been drinking again.
B.Yeah, probably scotch.
C.Yeah, scotch, I think.
D. Yeah, scotch this time. (ibid. p. 240)

Such system exists mainly in the form of dialogues, which presupposes shared beliefs, world view among people with close social ties. It is situation-dependent, which implies that non-linguistic communication by facial expression, body posture, gesticulations, etc. has major contribution to the interpretation of the message. To note, although the inferential language system usually exists in spoken form, lately through social media platforms it has adopted

written form.
To remind, the defining features outlined above describe the inferential systems of languages with long traditions of writing. That said, very similar structural properties are detected in languages of pre-literate societies, which, by definition, are unaffected by writing. As an example, Pawley (in Givon, Shabatani, 2009) describes Kalam, a language spoken in Papua New Guinea as follows : major parts of speech are nouns, verbs, verb adjuncts, adverbs, adjectives , locatives. Verbs are the only part of speech to carry grammatical morphemes as inflection suffixes for marking tense, aspect, mood, person and number of the subject. The most common clause type is SOV. A complex predicate is encoded by a verb construction derived by attaching verb adjuncts to a single verb root. Arguments known or recoverable from the context or already mentioned in previous context are omitted. Serial verb constructions are formed as a number of verb roots united in sequence precedes an inflected verb which carries all grammatical inflections for tense, aspect, mood and subject marking. The serial verb construction forms a single clause. The most commonly used verb roots are short, composed of a singe syllable or even a single consonant. Serial verb constructions are used in narrative where the goal of efficient packaging of information is achieved by the use of semantically and syntactically compressed forms.
A number of languages spoken by small hunter-gatherer tribes in Australia display the defining structural features of inferential system listed above (Cysouw and Comrie 2013) demonstrating their universality.
Predictably, such significant deviations from Universal Grammar suggest that such systems would present a pervasive ambiguity problem. That said, the lack of explicit structural detail in encoding semantic complexity is compensated by reliance on contextual clues, linguistic, e.g. intonation, stress, etc. and extralinguistic, e.g. gestural signals, facial expressions, etc. for the disambiguation of the message.

To note, it is argued and generally accepted that esoteric language systems exhibit significant grammatical complexity, while exoteric systems are significantly simplified under the influence of adult second language learners (Hurford 2012; Trudgill 2009). That said, Russian , a language with highly complex morphology during the centuries of Russian and later the Soviet empire was the official language of highly diverse populations of over 180 million people on a vast territory stretching on two continents. Its complexity did not impede adult learning and no significant simplification has resulted . Thus, complexity in esoteric systems and simplification of exoteric systems is probably a useful simplification of a complex phenomenon in terms of best examples.

Thus, the average speakers in all human communities, from the highly sophisticated civilizations with writing traditions extended by thousands of years, to illiterate hunter-gatherers, conduct the majority of their daily linguistic interactions using language systems with the same structural properties, which display the trademarks of the inferential system. Importantly, the inferential system is influenced by the constraints of spontaneous speech as a channel. For example the sentence is organized to fit in a single prosodic contour. The boundary between a main clause and a compliment clause is marked by a pause. Mithun (in Givon , Shibatani, 2009) writes:

“ spontaneous speech is typically not produced in a continuous stream. Speakers regulate the flow of information such that, in essence , they introduce just one new idea at a time per intonation unit or prosodic phrase. This new idea might be introduction of a new participant, action, time , place, or other new or significant item of information”(Mithun, ibid. p. 67) Further, citing Chafe (1994) she explains that “ an intonation unit can express no more than one new idea. In other words thought, or at least, language, proceeds in terms of one such activation at a time, and each activation applies to a single referent , event, state, but not to more than one” (Mithun, 2009, p. 67). This reveals a “ fundamental limit on cognitive processing which concerns the number of units of new information that can be manipulated in a single focus of consciousness.” (Mithun, 2009, p. 68)
In sum, the inferential system is universally used by all speakers, regardless of education , social status or profession. It presupposes reliance on close community ties, shared world view and communicative context as a component of a communicative ecosystem which includes non-linguistic communication. It is usually regarded as unsystematic and unruly, and as such, unworthy of serious study, although it demonstrates unique internal organization, systematic and universal.
A notable exception is J. Ginsburg's work (2009 and elsewhere) on formalization of the dialogue by incorporating it into the generative spectrum of paradigms as an extension based on constraint-based generative paradigm approach. That said, Ginsburg's formalization of dialogues is purely theoretical exercise with no implications for the characterization of the language faculty (at least I have not found any).

4. 2.3.Rudimentary language systems

“ Rudimentary” here is a label which, in my mind, is a fair description of a number of language systems united by common properties of a small lexicon of predominantly content words and minimal use of basic grammatical categories for marking objects, actions, properties, etc. These are known in the literature as “ lexical protolanguage ” and described as lexicon without grammar as they are said to resemble the earliest forms of language (Bickerton 1984 and elsewhere).

That said, in my understanding the lexicon, as a list of linguistic forms, is a continuum of content words and grammatical markers. A language system, even the most basic one, contains some grammatical forms which makes the concept of “lexical protolanguage “ vacuous. Moreover, it reveals an understanding of language as dichotomy of lexical and grammatical forms which is , in my mind, ill- conceived . This is why I prefer the term “ rudimentary language systems” to signal my understanding that the concept of language , as I understand it, implies a continuum of lexicon and grammar, meaning and structure.

A number of communication systems fall under the label of rudimentary system :

1.the communication of small children during the initial stages of language learning /acquisition, who learn language under normal circumstances. 2. the communication of feral children who learn language under abnormal circumstances after a long period of isolation which impairs the normal process of learning . 3. the early stages of newly emerged sign

languages , 4. Basic Variety , 5. pidgins, 6 .the linguistic communication of agramatic aphasics. 7. The linguistic achievements of trained apes.

Despite the vastly different underlying reasons for their existence these communication systems show remarkable similarities both in form and in function. They all exhibit the following common structural characteristics:

The rudimentary systems display the following common structural features:

1.a small vocabulary of lexical words with concrete meanings, organized in grammatical categories of object words (nouns) and action words (verbs), 2.hierarchical structure based on semantic relations, 3.serial verb constructions instead of sentence embedding, 4.extensive use of compounding, 5. a very limited number of grammatical words with more or less abstract meanings, no morphology, absence of abstract grammatical categories of subject, direct and indirect object, case, tense, aspect, complementizer, characteristic of grammars of modern languages, 6. no linguistic means to express negation and questions, functions fulfilled by intonation, 7. no signs of grammaticalization process, 8. no fixed phrase structure and phrasal embedding , 9. one-place predicates 10. lexical words are juxtaposed in their basic forms i.e. bare stems, 11. extensive use of stress and intonation as a replacement of grammatical devices.

In sum, rudimentary systems display consistent internal organization of essential vocabulary of predominantly lexical words organized in meaning-based combinations.

The following examples are illustrations .

* pidgin : A. What say? Me no understand. (Bickerton , Language and Species, 1990, p. 121)

* Genie: Applesauce buy store. (Bickerton, ibid. p. 116)

* child: Walk street. Go store. (Bickerton, ibid. p. 114)

* Basic Variety: Steel girl bread.(Bickerton ibid.)

* Nicaraguan Sign Language: MAN CRY

* agrammatic aphasics: She speak. (O'Conner, et all.2005)

* primate sign communication: GIVE ORANGE

The above identified features are universal explicable with similarity of functions, i.e. to cover the most basic communicative demands, which explains the semantic and structural limitations of these in the narrow circumstances of use listed above. This also explains why their use is supplemented by extensive participation of non-linguistic forms of communication: gesticulations, facial expressions, non-linguistic vocalizations, etc.

5. The three language subsystems and the LF

Linguistic theory is foundational for the study of the biological foundations of language. That said, linguistic theory must be constrained by the findings of biological sciences of the language-relevant properties in the human organism. So, the influence is a two-way street.

To reiterate, so far two extreme alternatives have been argued : one , by the biolinguistic perspective which states that language is grammar and its biological representation is in the form of an innate cognitive module, a grammar-producing algorithm i.e. Universal grammar , a crucial component of a complex cognitive entity, LF. The alternative defines language as a cognitive technology, a conglomerate of multiple cognitive and physiological traits coordinated into an emergent LF during language learning and activated by language use . In this context language has no innately pre-specified representation in the organism as it uses a number of pre-existing cognitive resources interconnected and repurposed for use in language-relevant tasks.

Neither of these extremes is a viable alternative. On the one hand, linguistic communication lacking some and even most of the grammatical details, postulated by the generative paradigm and made available by the innate Universal Grammar, is not only possible but empirically demonstrated, suggesting that more often than not, some, and in many cases, most of the cognitive resources of the Language Faculty have been bypassed and unused. On the other, like all species-specific behaviours and one of the defining features of the human species, language must rely on some innate foundations.

In disagreement with either of them , in the following segments I will argue that humans are born with innate propensities to learn the simplest language systems.

5.1.The rudimentary systems and the language instinct

To remind, instincts are patterns of complex behaviour which an organism follows subconsciously in response to environmental triggers . Instincts appear very early in life. They are innate, i.e. fixed in the genes and so unalterable by experience. Examples of instincts is nest building in birds and courtship during mating season in many species. They are typically stereotypical behaviours, i.e. display little variation among the individuals, although in many species instinctive behaviours involve learning to various degrees, e.g. song birds and young vervets must learn to use their vocalizations in the appropriate context (Hilliard, White, 2009) resulting in slight variation among populations. Overall instincts are behavioural universals with genetic bases .

Pinker (1984) attributes instinct properties to the LF which allow the child to identify, understand and construct grammatically correct and complex sentences despite lack of explicit instruction . He bases his argument on the assumption of universality of language acquisition, which, in his estimation, is accomplished in the first 12 years with apparently little exposure to the local language system. The argument for an instinct for UG suggests a direct connection between genes and components of grammar, which prompted researchers to search for confirmation of the hypothesis in the genome. FOXP2 gene was focused on and labeled as a grammar gene by a study of a unique case of a British multigenerational family , the KE family, in which about half of the members carry a deleterious mutation of the gene, expressed phenotypically in the so called “specific language impairments”(Gopnik et all. 1988) More detailed studies (Vargha-Khadem and colleagues 2005) dispelled the myth of FOXP2 and is implication in a language instinct.

5. 2. Language instinct reconsidered

As a counterargument I submit that, although there is no instinct for grammar, there is instinct for language : the human organism has instinct-like potential supporting the attainment and processing of the most primitive language systems. This innate predisposition for language, a language faculty of sorts , supports the simplest, yet, highly useful forms of language, traditionally labelled as protolanguage. Thus, we are born with the bare minimum although specific linguistic potential. This is not a new idea: Bickerton (1984 and elsewhere) has argued for innate foundations of protolanguage, attributed to pre-human species and inherited by humans. As mentioned above, I disagree with his concept of protolanguage and claim that the only instinct for language supports primitive or rudimentary, systems with the following indispensable characteristics:

* some guiding principles for word formation (Bloom 2000) participating in the formation of a small lexicon of predominantly content words in their basic form as labels for concepts of human, animal, tree, sky, place, fire, stone, etc. organized around semantic principles
* primitive grammatical categories encoding dichotomies of animate vs. inanimate, human vs. non-human, singular vs. multiple, close vs. distant , presence vs. absence, instantaneous events vs. processes of long duration, measurable vs. unmeasurable substances, etc.,
* a form of theory of mind which allows ostensive communication , i.e. participation in dialogues by Grician principles of conversation.
* Importantly, rudimentary systems are externalized by human physiology, predominantly in speech, which at a minimum require capacities for speech production and perception.

Such language systems must be easy to process, learn and pronounce, i.e must be energy-efficient for an organism to cope with the high energy demands of life in prehistoric contexts. Such form of communication must be communicatively functional in its ability to rapidly and precisely process and articulate a limited but crucial amount of information especially in situations of life and death, and efficient in terms of energy costs.
A hypothesis for a language instinct/ innate LF with these characteristics is plausible for the following reasons:

a. Rudimentary systems emerge early in life.

The development of normal human children includes the attainment of a rudimentary language system with the universal characteristics outlined above with no explicit help from adults and , arguably, from minimal exposure to linguistic experience and with little apparent effort by the learners. As such this process is best termed as language acquisition.
Importantly, it displays similarities to instinctive behaviours in other species.

b. Rudimentary systems are a default response to communicative emergencies.

Pidgins emerge in highly unusual circumstances where normal adult speakers of modern languages find themselves in an communicative emergency situation where speakers of mutually unintelligible languages are forced to interact. Using their intuitions and ingenuity, they cobble together a simple, yet very useful for its purpose, system, a mixture of the

language systems of their native languages, i.e. a pidgin . That is, the formation of a pidgin is a default solution to a communicative emergency. This makes it similar, although not identical, to instincts : we all instinctively run for cover upon hearing a loud noise. In a similar fashion the simplest linguistic systems act as a default on which people fall back in emergency situations when they normally react by retreating to default behaviours. Assuming that the formation of a pidgin is reminiscent of instinctive behaviour, it is suggestive of some innate predispositions and a role of phylogenesis. There is a difference, though : language, unlike instincts proper, requires learning. This is why it is pertinent to talk about instinct-like linguistic behaviour.
Basic Variety (Klein, Perdue 1997) another primitive language system similar to pidgins in both form and in function. It is formed when adult native speakers of modern languages find themselves in an unusual situation to which they have a reaction similar to pidginization where their most frequent communicative interactions are mainly in their native language with the immediate family and the closed social circle of fellow compatriots and speakers of the same native language, which is not the dominant language in the community. For their interaction outside the inner circle with speakers of the local language they compose a distinct language system with universal properties , structurally similar to pidgins and sufficient to cover their communicative necessities, limited in scope and duration, i.e. Basic Variety, applying the same type of defensive strategy. An example are Chinese immigrant neighbourhoods in some North American cities where older Chinese immigrants conduct their normal life and business with minimal proficiency in English, mainly because they rarely need it.
This confirms the preliminary assumption articulated above that the formation of a rudimentary system is a natural reaction similar to instinctive behaviours.

c. The formation and use of primitive language systems is uniquely human behaviour, suggesting innate specialization.

Resent experiments with modern primates which have demonstrated some isolated cases of individuals capable of learning and using some form of primitive language-like communication, may be taken as confirmation that such systems are learned in the absence of LF. And in the case of primates this is accurate. That said, in primates this is achieved only as a result of intense efforts both from human teachers and primate learners, which is hardly instinct-like. Moreover, although in their natural habitats primate species have rich social lives and complex social relations, none of them have attempted to share their individual mental lives by inventing anything resembling a pidgin or any other form of language, which would demonstrate innate urges for such behaviour, consistent with an instinct.

And although lately arguments are made that non-human homo species, Neanderthals and Denisovans, had propensities for language similar to human's (Dediu, Levinson 2013) , although well founded by multiple lines of evidence from genetics, physiology, cognition, etc. the fact of their extinction precludes further empirical confirmation. Thus, we may never know wether the extinct Homo species had a form of LF.

One may also argue that the use of primitive systems by humans does not require innate specification and is accomplished without engaging the LF, as it is in non-human species.

Nevertheless, human children demonstrate innate capacities for primitive systems by not only learning, but also spontaneously inventing new linguistic forms and adult humans spontaneously invent entire language systems, which start as meaning-based primitive systems, demonstrating instinct-like specialization and only later with time and experience develop grammatical machinery of increasing complexity, suggesting that structural sophistication comes with gradual improvement and results from experience.

This altered view of the LF would have the following consequences:

A. for linguistic theorizing: 1. the LF is only a small portion of the language representation in the brain, a view consistent with Chomsky's (although divergent from his focus on recursion as a defining feature), 2. LF produces meaning-based language systems, 3.a theory of language cannot be based on LF and not on the brain alone i.e. the object of study for biolinguistics must include all language-relevant aspects of the human body, brain and mind .

B. for evolutionary linguistics: 1.the origins and evolution of language cannot be understood with a theory based on modern language, as articulated by the generative/biolinguistic perspective.
On a different but related note, language is only one of a number of uniquely human traits. In the following segment I will offer a plausible speculation that the biological foundations of language are similar to those of the rest of the uniquely human traits and displays similar patterns of development.

6. Unique human behaviours and innateness, a plausible speculation

Language is a unique human trait, although one among various others such as dance, tool use, music, abstract thought, art , etc. Given that, it is logical to speculate that they all may rely on some form of instinct-like innate intuitions, spontaneously demonstrated very early in life and triggered by very limited exposure to stimulating environment. To take an example, all humans have some ability to participate in cultural activities , e.g. singing, dancing, etc. and demonstrate some innate potential for these abilities very early in life. Infants display sensitivity to rhythm, which indicates some rudimentary predisposition for music and dance. Similarly to language, with this minimum innate support any child can presumably learn any song or dance reflective of any cultural tradition. A comprehensive discussion on the topic of innate capacities for music can be found in Mithen' s book The singing Neanderthals.

Infants also display basic ability to manipulate tools suggesting some biological foundations for tool manipulation, further developed and demonstrated by all adults in everyday manual tasks. On these essential biological foundations after persistence, dedication, and specialized training, some individuals achieve professional skills of a master craftsman . In addition, infants demonstrate sensitivity to visual symmetry which indicates innate potential for appreciation of beauty and visual arts and any person can learn to draw at some elementary level. These are innate ingredients which, after extensive training produce a Michelangelo. Moreover, pre-linguistic infants form abstract categories, e.g. animate /inanimate , singular/plural, and make inferences, which is the beginning of abstract thought, later developed as argumentation in

everyday decision-making and further mastered as a professional tool in scientific argumentation, mathematics, law, philosophy, etc. The average human achieves a minimum proficiency in these activities with little instruction and with little effort, indicating some innate, instinct-like potential.

I am not aware of any detailed studies of the biological foundations of singing or dance, or other uniquely human behaviours with the exception of Liebermann (2016) who has argued for innate potential for language and culture as a network of neuronal pathways and brain areas including the basal ganglia and the cerebellum which in concert make possible dance, language and other structured behaviours .

Thus, humans have demonstrated some rudimentary , instinct-like propensities for unique behaviours, language being one of them, suggesting some role of nature. On these rudimentary biological foundations the average human builds upon to reach an average level of proficiency with minimum training. Further a small number of individuals achieve the highest levels of mastery only after extensive, conscious and rigorous training and education which the innate flexibility of the human mind and body makes possible.

In this context, if one is to infer the human innate predispositions for unique human behaviours, one would extrapolate these from the behaviours of the average human individual and not confuse the innate potential to sing , draw or manipulate tools from the achievements of Pavarotti, Michelangelo, or some other master of the respective trade.

Returning to the topic of innateness of linguistic abilities, in my mind there is no reason why the same logic of anticipating innate predispositions limited at a very rudimentary level should not be applied to the language abilities as well, although language is treated differently by the major linguistic paradigms as it is assigned a status of the most defining characteristic of the human species.

To remind, in generative context the innate predispositions for language are defined as Universal Grammar, a highly complex algorithm with characteristics determined by strict criteria of grammaticality and well-formedness, most accurately exemplified by the code system and attributed to the mind of the idealized human.

At the same time the linguistic output of the average human has proven to deviate significantly from the language system, attributed to the ideal, professed to be universal and instinctive. In this sense, given that for any other unique behaviour the innate potential would be estimated by the abilities of the average human individual, estimating the role of nature in human linguistic abilities from results clearly achieved by nurture is highly questionable.

And although my views are clearly speculative as I cannot rely on studies of cognitive foundations of uniquely human behaviours other than language, my speculations are plausible and are likely to be confirmed in future studies by scholars with relevant expertise.

In sum, a plausible argument can be made that 1. all uniquely human behaviours follow the same pattern of relying on rudimentary innate bio-cognitive foundations on which epigenetic and developmental mechanisms build to reach an adult form by spontaneous learning . Further a professional level of mastery is reached by a few individuals after years of dedicated and

supervised training. 2. the natural potential for language should be measured in the same way the rest of the unique properties of the human species are to be measured, by the production of the average, normal individual. I am specifying linguistic production, not comprehension, because in spontaneous conversations , which, in my understanding are the clearest representation of natural language, the correct decoding of the message is not limited to capturing the meaning of linguistic forms alone as extralinguistic factors, e.g. facial expression, gesturing etc. aid the listener in the correct dis-ciphering of the speaker's intended message.

One might object, arguing that the three E-language subsystems discussed above are the result of different resources of the language faculty being selectively deployed to match external factors determining its communicative use. Thus, one could argue that the fact of selective use of UG does not challenge the argument for its innateness.

That said, to remind, rudimentary systems are acquired early and engage various spatially distributed brain regions (Friederici 2017) following a pattern parallel to other unique human behaviours, suggesting common underlying universal and uniquely human propensities for language and culture. The attainment of the code and inferential systems is achieved later and with effort and experience, on par with the above mentioned human behaviours in reflection of culturally diverse patterns. In this sense the attainment of rudimentary system is best termed as language acquisition or cognitive growth and further mastery of the two subsystems as language learning. And although language and other unique human behaviours could have comparable rudimentary biological foundations, language is the most intensely practiced resulting in a near uniform level of proficiency.

In evolutionary context one could argue for common innate propensities for the essentials of language and culture as alternative interpretation of the argument for the evolution of language as part of a human cognitive niche comprised of abstract thought, hyper-sociality and complex language (Pinker 2003, 2010). This topic is beyond the limitations of this article and will not be discussed further.

7. LF in evolutionary context

7 .1. The argument for UG and Darwinian principles

To remind, Darwinian evolution has the following fundamental principles: continuity, survival advantages and lack of foresight. The first means that a trait must have precursors in related species. The experiments with trained apes, which have demonstrated impressive accomplishments in learning some elements of a primitive language system , essentially comparable to that of a human child, demonstrating continuity. The second means that a trait must be adaptive to some part of the environment , thus, deliver survival advantage to its bearers compared to alternatives in a certain context. i.e. the essence of the evolutionary process is the selection and propagation of traits which are the most adaptive in the current environment and can assist the reproductive success of the individual or species which possess them. And if language is to be understood as being represented in the human organism as a language faculty of some form, as one of the defining properties of the human species and as

such as a product of evolution, the evolutionary principles dictate that such entity must support a communication system most adaptive for life in the circumstance in which this evolutionary process was taking place, i.e. as adaptation to pre-civilization habitats.

In this sense the claim of the biolinguistic perspective for the arbitrary nature of linguistic computations (Chomsky 1980, 1995) thus irrelevant to the survival of its bearers contradicts the argument by Pinker and Bloom (1990) that they have evolved by natural selection, making these two arguments mutually exclusive. Equally contradictory are the generative claims for universality and immutability of the LF.

At the same time Pinker and Bloom's argument has its own inconsistencies as it claims that a language capacity for complex syntax is evolutionarily advantageous as it is indispensable for activities like philosophy, literature, law, science, emblematic of modern civilization. If one accepts the dating of the appearance of a language capacity at about 180,000 years ago(ya) , then complex civilization, science, art and philosophy could not have been the environment triggering this adaptation. Evolution is not a leader, it is a follower. Thus, if one accepts that the LF has evolved by evolutionary principles as adaptation to pre-civilization environments , it cannot contain adaptations for future environments. In sum, a LF for modern grammar, i.e. UG, cannot be explained in phylogenetic terms.

Jackendoff' 's argument (2002) for a LF providing a range of innately predetermined options of grammatical devises for individual languages to choose from is also unsustainable on evolutionary grounds given that evolution is generally efficient and frugal and avoids waste of resources.

Thus, the biolinguistic argument has internal contradictions which hamper the understanding of LF, its understanding in evolutionary terms and the overall evolution of language. That said, the evo-devo perspective finds points of agreement with proponents of the usage-based views which promises future fruitful collaboration (Benitez-Burraco, Boecx, 2014).

From a slightly different perspective, various generativists (Pinker,1994 and elsewhere, Chomsky, 2010) has famously argued that UG is a result of a genetic mutation producing significant brain reorganization in a " hopeful monster", a human individual with advanced problem-solving abilities explicable with superior cognitive abilities for abstract thought, a Language of Thought, subsequently adapted to use in communication. The mutant is also attributed superb reproductive advantages making possible the proliferation of the mutation in a small closed population, envisioned to have resulted in the birth of human species.

Such significant evolutionary event is usually regarded by evolutionary biologists as highly implausible. I am not qualified to opine on matters of evolutionary biology and instead I will offer comments referring to fundamental and well known principles of mathematics and biology. One must start by reminding that the brain is a major consumer of energy, estimated at about 20% of the entire energy demands of the biological body, distributed between the two hemispheres in cognitive and perceptual functions. In this context the appearance of a novel cognitive structure of significant computational complexity would result in increased energy demands by the left hemisphere and especially the Broca's, which would trigger a significant diversion of energy distribution to this location.

To note, although internal organization and processing details of the LF envisioned in minimalist context are greatly simplified, as compared to earlier versions, LF is still a highly complex algorithm, demanding significant energy supply for its functioning.

And assuming that the energy demands of the entire brain remains constant, it follows from basic mathematics that the energy supply to the rest of the brain, i.e. to the right hemisphere where emotions and socialization are processed , as well as processing of perception in both hemispheres, would be diminished, leading to their underdevelopment and deterioration of their original functions. It is a zero- sum game. This would produce an emotionally and socially deficient individual, jeopardizing his chances for successful reproduction. Diminished perceptual abilities would, in addition, jeopardize biological survival, precluding the proliferation of LF in the population.

One could indulge in speculation that cognitive resources for UG may have appeared somehow at some point in human evolutionary history. Given the lack of usability in the environment of its appearance, in addition to the unsustainable energy demands, such a formation would be eliminated by selection forces. We know that cave animals, e.g. bats, have lost their vision i.e. sensitivity to light , as adaptation to cave living as the brain cells, which evolved to become excited by light, persistently become unused generation after generation. So, assuming that for the most part of the history of the species a hypothetical grammar algorithm has remained unused for the reasons outlined above, like the vision in bats, it would have been eliminated by evolutionary forces. Moreover, in addition to high energy demands for processing, complex grammar requites longer time and more efforts to attain, further reducing its adaptive advantages, compared to a capacity for primitive language system.

So, it seems that the elaborate complexities of modern syntax have no adaptive advantage for the first sapient language speakers in their authentic environments.

Equally unsustainable is the argument that a highly detailed grammatical system can be installed in the brain by gene-culture co-evolution as a Baldwinian process of genetic assimilation of previously learned behaviour, given the fast speed of language change compared to genetic evolution (see Fedor, Itzess, Szathmary, 2009, p. 32; Christiansen, Chater, 2008). Ergo, direct genetic representation of grammar rules is highly unlikely and could at best be limited to some very general aspects of patterned meaning representation.

7. 2 . A Language Faulty, an instinct for rudimentary language systems and Darwinian evolution

Scholars diverge on the question of what the rudimentary systems reveal about the evolution of language along the dichotomy of phylogenesis vs. glossogenesis.

On the one hand the formation of pidgins by modern language speakers is regarded as a demonstration of pre-human capacity for protolanguage. That is, pidginization is said to be a demonstration of 1. prehuman stage of the phylogenesis of the Language Faculty and 2. a bio-cognitive precursor to innate UG (Bickerton 1984 and elsewhere). Bickerton argues plausibly that the biological foundations of pidgin-like rudimentary systems i.e. his lexical protolanguage, result from regular Darwinian processes and as such must be universal and

general enough to allow further learning of local languages during development.

Alternatively Mufwene, (2009)argues that pidgins, despite being extremely simplified, are still forms of language as they demonstrate the hallmarks of a human language, i.e. to encode and express infinite number of human thoughts by combining a limited number of linguistic forms, although representing the lowest boundary separating language from non-language. To remind, Chomsky identifies syntax to be the hallmark of language. That said, it is empirically demonstrated that the simplest linguistic forms fulfil all the functions complex languages do. As Comrie and Kuteva (2005) have demonstrated, complex ideas are not necessarily encoded in complex linguistic forms. Various grammatical categories whose existence cannot be justified with adaptive function as the concepts they encode can easily be expressed in lexical words.

"...It is well known that even notions such as temporality do not necessarily need to be encoded by grammatical morphemes. " (Comrie, Kuteva, 2005, p.190).

In fact, these and other authors have shown that there are almost always alternative means for expressing the meanings of most grammatical categories through use of lexical items, intonation etc. The communicative function of sentential recursion, deemed to be one of the hallmarks of language by the generative paradigm, is alternatively fulfilled by juxtaposition of single-clause sentences with no loss of semantic details or expressive power. And language systems of lesser grammatical detail than UG are fully capable of verbalizing the same meanings with the same precision, which makes translation possible. And given that various languages spoken by small isolated communities, for example Piraha, Riau Indonesian and others, bare close similarities to pidgins, the difference between rudimentary systems and full languages is a matter of degree.

7. 2.1.Rudimentary systems as adaptation

Evolutionary principles specify adaptive superiority to alternatives in present environments as essential for evolutionary success. And we can assume with confidence that the communicative needs of the first speakers must have been primitive, e.g. informing others about perceived treats, organizing a hunt, or settling a dispute among rivals, etc.
In this sense the simplest , most primitive forms of linguistic communication are well suited for solving ecological problems in the wild as well as interpersonal and inter-tribal conflicts, circumstances typical for the daily life of our ancestors as members of small groups of individuals, usually united by family ties, or a "society of intimates" (Givon 2002, p. 301-331). Moreover, the close relations among communicators in a small isolated community implies that a significant portion of the knowledge is shared by all members, i.e. there is information equality, and the need for its explicit communication by linguistic means never arises as it is either implied, or shared by non-linguistic means e.g. songs, rituals, gesticulations, etc. So, the information encoded in linguistic means is a small portion of the sum total of information available. Moreover, to be usable linguistic forms must be easy to process, learn and pronounce, that is, they must be energy-efficient to be adaptive in a body for

which life in the wild demands a great deal of energy, cognitive and physiological. Efficiency, precision and accuracy in communicating essential information, especially in situations of life and death, is fundamental especially if daily encounters with the uncertainty of brute nature are part of life.

In addition, the primitive systems discussed above offer adequate communicative precision, processing efficiency and ease of learning, highly beneficial for the survival of its users. So, the evolutionary principles dictate that a language capacity must support a communication system most adaptive for life in the circumstance in which this evolutionary process was taking place, i.e. as adaptation to pre-civilization habitats.

Thus, the primitive forms of language outlined above comply with these requirements, suggesting that biological and cognitive resources supporting such forms of communication will be highly adaptive in the natural and social environments the first human language users were functioning .

At the same time the elaborate complexities of modern syntax have no adaptive advantage for the first sapient language speakers in their authentic environments. Extended vocabulary and abstract grammatical categories become necessary for functions beyond essential survival as one of the markers of group identity deployed in story telling , myths of creation which brings about metaphors and other figures of speech in literature, songs etc. They are demonstrated in the spontaneous dialogues of modern language speakers, which contain linguistic forms more sophisticated than the primitive language systems. They are as diverse as languages, ergo, they cannot be innate in any way.

Grammatical categories and rules found in modern languages are better explained as emergent phenomena, and as such are unique to each linguistic community. Importantly, language diversity is reflected in the differences in functions and location of language processing as, as per Friederici (2017, p. 162) Chinese, German and English are processed in very different and relatively distant locations, anterior temporal lobe (ATL) for English, inferior parietal lobe (IPL), for Chinese and inferior frontal gyrus(IFG) for German. On the other hand, pidgin-like primitive language systems composed of groupings of lexical words in their base form, i.e the metaphorical atoms of language, have the same features across languages, which suggests innateness and universality.

In short, simple language systems with pidgin-like characteristics are born out of survival necessity, complex languages are born out of the extensive communicative needs of complex civilizations where the preoccupation for physical survival is far removed. Civilizations, even primitive ones, develop linguistic complexity for expression of group identity. Crucially, from the perspective of evolutionary linguistics the goal of enquiry becomes to explain the phylogenesis of a language capacity for the rudimentary language system.

Summary and conclusions

The argument presented here is a different angle on the well known generative argument for minimally specific biological foundations of grammar advocated by Chomsky in the

Minimalist program (1995 and elsewhere). Moreover, even Chomsky has acknowledged that language is largely learned and even speculating that FLN could be empty, as grammatical irregularities and the lexicon are idiosyncratic to each particular language, indirectly acknowledging that language can be theoretically envisioned in terms of phonology and semantics.
Typological studies have confirmed that most grammatical categories are language-particular, i.e. that languages are largely learned. (Evans, Levinson 2009). To note, in bio-linguistic context language diversity is either rejected or explained with diverse combination of parameter settings, there is no agreement among scholars on how many parameters to postulate as innately predetermined and it is not clear where in the brain parameters and their binary settings are located in relation to the principles and the rest of the language faculty and what are the brain mechanisms involved. Overall, although the argument for pervasive and theoretically significant role of language diversity has been challenged by some generative scholars (Mendivil-Giro, 2012), it has not been rejected by the majority of linguists.
Moreover, meaning-based pidgin-like language is acquired early in development, as per Friedericci (2017, p. 229-) by 5 years, while full mastery of syntactic complexity comes much later, at 12 years of age, suggesting that a pidgin-like language system relies predominantly on innate capacities, while complex grammar requires much more experience and involves more than a decade of intense experience with language. In short, both theoretical speculations and empirical findings converge by identifying a language faculty for protolanguage-like primitive systems as broad enough to allow further development of language diversity and specific enough to stipulate a distinctive behaviour.

I have argued that evolution has prepared the human organism with innate intuitions essential for the formation and learning of rudimentary language systems , proven to be effective in the function of encoding the essentials of human semiosis. As such, these are highly adaptive in the pre-civilization habitats as the natural environment for our ancestors. On the basis of these bio-cognitive essentials communities build the diversity of sociolects both in space and time.

Importantly, natural language, as a human behaviour exemplified by the communicative interactions of the average adult normal individual, is a very specific way of informing through repeated interaction by participation in dialogues, reflected in the vision of the human language faculty articulated here.
Crucially, detailed knowledge is now available of how the brain represents and processes language, which demands theoretical adjustments. And if one strives for conceptual consistency and aims to preserve the concept of language faculty, it needs to be reformulated in terms of innate propensities for meaning-based rudimentary language systems. In addition, some concepts from the generative theoretical arsenal can be reinterpreted, for example Merge in the semantic space can preserve its role as essential operation in a meaning-based system.

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