RECENT EMPIRICAL INQUIRIES CHALLENGE SOME CORE ASSUMPTIONS OF LANGUAGE, ITS EVOLUTION AND HUMAN MIND, opinion article

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ABSTRACT

The extensive and detailed inquiries in a number of fields aimed at understanding the evolution of language have accumulated new knowledge of unprecedented levels of detail and debt . Some of this new information has altered significantly our understanding of key aspects of language , e.g. the language system , language acquisition, language universals, language functions, etc. and challenged some of well-established views of language-relevant aspects of the human organism, the status of our species as the only language users, language diversity, protolanguage, language evolution, etc. thus opening new trajectories for future inquiries on multiple fronts.
At the same time empirical inquiries have revealed some noteworthy challenges, rooted in the very nature of language. As a multifaceted phenomenon, it requires coordination and convergence of perspectives from a wide variety of unrelated fields of inquiry, each with highly specialized conceptual framework and alternative lines of argumentation, which makes convergence on common terminology and integration of theoretical perspectives a challenge.

Keywords: Language Faculty, language evolution, protolanguage, language diversity, language acquisition,

INTRODUCTION
Language in linguistic theorizing: the current status quo

The current understanding of language is along two mutually exclusive lines of reasoning: language as a biological organ and linguistics as biology vs. language as communicative technology and linguistics as a social anthropology. In this context the term " language evolution" refers to two different processes, as phylogenesis of language-relevant aspects of the human organism and as glosogenesis or an instance of cultural change guided by Darwinian principles. These two very different perspectives on language evolution reflect the respective theoretical instruments which explains the different conclusions. On the one hand, the biolinguistic perspective studies the biological body and mind of the human individual and starts form the assumption that there are aspects of human biology and cognition, designed by evolution for language processing and learning and aims to uncover their content and evolutionary history. The usage-based perspective studies languages starting form the assumption that what evolves is communities and their languages within the limits of the biological body and mind and aims to uncover patterns of language change and understand the factors which influence them.
The last three decades are marked by an explosion of studies in various fields directly and indirectly relevant to the study of language evolution. Empirical findings from fields as diverse as linguistics, anthropology, primatology, genetics, psychology, computer science, have made significant contributions to our understanding of language, the human individual,

both as a biological body and as a group member. Most importantly, empirical studies have radically altered our previous understanding of language, the human brain, linguistic communication, which was largely based on idealizations and preconceived postulates . The new findings have confirmed some but also revealed that many of our conceptions and theoretical ramifications of language have been misguided and are not sustainable any longer. The aim of the following article is not to offer an exhaustive summary of all the diverse viewpoints . This is neither necessary , as multiple such revues already exist , nor is it possible within the limitations of an article. Instead, I will offer my own interpretation of how empirical findings alter our earlier understanding of language, the human organism and humanity .

The term " biological" I use to refer collectively to bio-chemical, anatomical, neuronal, physiological, genetic, aspects of the organism.

1. Earlier speculations on the role of genes in functioning and formation of language -relevant brain activity were challenged.

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 M. et all. 1996).

These preliminary preconceptions were contradicted by 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" (A. Fedor, et all, 2009, p. 307) . Given that, the role of genes in human cognition is extremely difficult to establish as the role of genetics in the formation of the phenotype is extremely 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 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 (S. Fisher, G. Marcus, 2006)

The FOXP2 gene 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, general intelligence, known as Specific Language Impairment (SLI) (Vargha-Khadem F. and colleagues 2005).

Moreover, as per A. Fedor, P. Ittzes E., Szathmary, (2009 p. 24) some children with SLI have the normal version of FOXP2 gene, confirming the general principle of biology that the role of individual genes in the formation of the phenotype is indirect and difficult to

establish.

Subsequently other genes were determined to participate in the formation of human linguistic abilities. Lately other genes, e.g. ROBO1, ROBO2 and CNTNAP2 which increased in frequency after the speciation of anatomically modern humans, were determined to be implicated in language-relevant functions, among various others (D.Dediu, V.Levinson, 2018).

The study of the role of genes in the biological foundations of language and evolutionary aspects of these is challenged also by the fact 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 (M. Lamb, E. Jablonka, 2005; S. Fisher, G. Marcus, 2006) .

In sum, given the pervasive pleiotropy in the formation of biological bodies and the human organism in particular, geneticists anticipate to find individual genes to have insignificant effect in the formation of the biological foundations of language (A. Fedor, P. Itzess, E.Szathmary, 2009, p. 22).

In addition, experts foresee that 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 (S.Fisher,G. Marcus 2006). This is 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 (C. 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.

2. The biolinguistic view which defines language as a cognitive capacity independent of modality of externalization is not sustainable.

In the context of the mentalist /generative perspective the argument for independence of the language system from language use is premised on the idealized model of the human brain (N.Chomsky, 1972, 1986, 2000). The seminal paper by H. Poizner, U. Bellugi and E. Klima in 1990 on sign languages which argues convincingly that sign languages have universal properties, has been taken for additional confirmation of the argument for Universal Grammar. Thus, the generative/mentalist perspective attributes to the brain the crucial role in determining the shape of language and in this context the physiological properties of the channel by which the message is delivered are of no consequence.

That said, language is a system of symbols. Both dominant perspectives implicitly or explicitly converge on this assertion. Ever since Saussure lexical items are defined by it symbolic nature. The usage-based paradigm defines language as lexicon of constructions , i.e. accidental associations of form and meaning of various types and sizes, thus, by

definition, a symbolic system. The generative view of language which has consistently argued against the usage-based argument for the inherently communication-driven nature of the language system as it defines language in terms of computation, i.e. manipulation of symbols. Computations in UG are by definition internally motivated   structural relations, assembled by accident and insulated from perceptual experience, i.e. an essential aspect of symbols. Thus, language is indisputably a symbolic system. And symbols, a type of signs, are by definition a pair of abstract meaning and a material form. Signs imply communication as the only reason for attaching a label to a meaning is to make it noticeable by someone else, i.e. to prompt its interpretation. The interpretation of computations is possible only through its externalization by material signs. So, computation is essentially communication and linguistic computations have a communicative function. It follows that language as inherently a communication system. As linguistic signs have an abstract and a material component they implicate both human cognition and physiology. Thus, language is a bio-cognitive behaviour which includes physiology.

The close association of cognition and physiology in human evolution was demonstrated by empirical studies which show that human physiology has evolved to support speech. The FOXP2 transcription factor is found to influence speech and language skills. The mutated version of FOXP2 gene affecting the Ke family causes deficits in grammar and speech . Thus, the evolution of the speech capacities is a vital component of language evolution (Ph. Liebermann 2007). It is present in many species as distantly related to humans as rodents, birds, even fish with highly conserved functions where it influences the development of coordinated movements , and in birds and mammals vocal communication and vocal learning (S. Fisher, G.Marcus, 2006), suggesting continuity of life forms and functions. Thus, from evolutionary perspective the human capacities for language cannot be dissociated form speech capacities.

The same pattern of close association of cognition and physiology is demonstrated in language attainment by youngsters as the infant brain displays sensitivity to speech, prosody and syntax which suggests that the influence of the environment in language attainment begins much earlier than previously assumed, even before birth. (G..Dehaene-Lambertz, 2017).
In sum, the abstract and the material aspects of language are intertwined in language use, language attainment and language evolution.

3. Better understanding of the genome and its relation to language has also dispelled the myth that the Language Faculty is universal and uniform (N. 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 princi pe in biology should not apply to the Language Faculty (K. Stromswold, 2010). Moreover, cognitive capacities for language are inherited along with physiological abilities , as the KE family case clearly demonstrates (F. Vargha-

Khadem, 2005). Thus, individual speakers are expected to differ in their linguistic abilities, both in competence and performance.

Genetically based phenotypical traits like deafness, stuttering , dyslexia , etc. influence language proficiency. 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 a language faculty as a biological organ, and the claim of its universality in rejection of the role of evolutionary principles.

4. Locating language in the brain

The presence of language-relevant functions in the brain is understood by linguists in two mutually exclusive ways. In biolinguistic circles the standard view of the representation of linguistic knowledge and processing advocates for spatial and functional segregation of language in the brain in Broca' s area, identified as the grammar organ, or the location of syntactic computations (N.Chomsky, 1968 and elsewhere ; S.Pinker 1994; D. Bickerton 2014). The segregationist argument was based on the argument for modularity of human cognition (J. Fodor 1983).

Alternatively the brain is understood as a flexible multipurpose processor, where linguistic functions are highly distributed and coordinated by experience (B. MacWinney, 1998, T.Deacon 1997, Ph.Liebermann 2000)

Recent empirical studies conclude that the localization of language in the brain is difficult to pinpoint given that a large portion of the brain is involved in language-relevant functions, including subcortical regions such as striatum, cerebellum, thalamus, among various others (Fisher, Marcus, 2006). Moreover, the young developing brain is flexible and able to compensate for damaged abilities, linguistic and other wise, as demonstrated by recoveries from injuries, which makes attempts to isolate language areas even more challenging.

The finding that there is no one-to-one correspondence between syntactic phenomena and brain functions adds to the difficulty, e.g. the brain does not differentiate between pronouns and reflexives (E. Kaan, 2009).

Further, empirical studies of language processing by PET scan and MRI have found difficulties in isolating purely syntactic processing from semantic and context influences as these are always intertwined. In addition, purely syntactic computations involving long distance dependencies are not concentrated in any one location but involve coordination of a network of neurons located in various parts of the brain. Broca's area, long assumed to be the location of syntactic computations, or the putative language capacity, is demonstrated to be involved in a number of functions , including non-linguistic functions and integrates information form different domains. Thus, "... none of the brain areas activated ...and elicited in syntactic tasks are unique to syntactic processing " (E. Kaan, 2009, p. 130.) Thus, syntax is not localized and no single area of the brain is involved solely in processing syntax.

In sum, processing of syntax by real brains is accomplished in quite different manner and deviates substantially from the theoretical assumptions of linguists and involves the coordinated activation of subcortical areas, the temporal, parietal and frontal lobes.

The argument for domain specificity and local concentration of linguistic functions has been challenged also by empirical findings that all deficits in language-relevant functions labelled as Specific Language Impairment (SLI) "...can be traced back to impairment of a system that is implicated in functions other than language"(D. Bishop 2009, p.192).
The language faculty is said to be " the most invasive",(B. Gulyas, 2009, p. 59) i.e.the most widely distributed cognitive faculty in the human brain (Ph. Liebermann, 2000; D. Bickerton, E. Szathmari, 2009). Moreover, it is suggested that the widely extended and diversified interconnectivity of the human brain, compared to that of chimpanzees and macaques, makes possible the integration of various types of information, i.e. phonological, semantic, lexical, grammatical, stylistic, in the verbalization of thought (B. Sherwood et all. 2008).
That said the established view that linguistic functions in most normal individuals are asymmetrically concentrated in the left hemisphere is still valid (A. Fedor, et all, 2009).
In addition, it has been argued that ,as a general tendency, domain specific mechanisms arise during ontogeny under the influence of experience forming domain-specific configurations of neuronal connectivity. (C. Sherwood et all.2008)
At the same time, scholars do not question the prominence of the Broca's and Weernicke's regions in linguistic functions. As per Fedor et all. (2009) although " the enormous plasticity of the developing brain ...demonstrates that the crucial involvement of Broca's area in syntactical processing in most people cannot be genetically hardwired, rigid condition...It seems more correct to say that some areas of the normally developing human brain are more prone (in quantitative sense) to host and process different components of language than others " (ibid. p. 300).
From a different perspective, the generative approach has argued, most recently by M. Everaet, et all. (2015) that the brain builds language top down , i.e. the linguistic computations start from syntax and proceed to semantics and phonology, syntax being at the top of the hierarchy. An alternative view is informed by the findings that lexical, semantic and syntactic information encoded in a word is used to anticipate the likely lexical, semantic and grammatical features of the following word, i.e. bottom-up (P. Hagoort, 2009; A. Fedor et all. 2009, p. 315). In short, a conclusion is warranted that the brain processes language in parallel in alternative ways.
In sum, ".. most cognitive operations will fall somewhere between the two extremes. And although localization of functions in the brain is not in dispute, domain specificity of linguistic functions has to be viewed as a continuum , ranging from cognitive operations implicated only in syntax and nothing else, to cognitive operations implicated in multiple kinds of mental processing including linguistic computations " (Bishop 2009, p. 192).
Thus, language is represented in the brain as a complex network of neuronal circuits widely distributed and occupy about half of the human brain, although most prominently in Broca's and Wernicke's regions in most normal healthy individuals.

5. Earlier understanding of Broca's region and its role in language processing has been altered.

Segregationist accounts, traditionally focussed on Broca's area in the frontal cortex, assumed to be the language organ and the processor of syntax, 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" (P. Hagoort, 2009). It integrates various types of information retrieved from memory and provides internal organization in music, language, praxis, etc.(C.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 (C. 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.

6. The argument for apparent similarity/equivalence between the language faculty 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 challenged.

For one, growing a kidney 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, the tissues of which biological organs are made is very different from the neurons of the brain. 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 as a cognitive organ is flexible and in cases of damage linguistic functions are relocated and assumed by some other part of the

brain. Moreover, a biological organ, once developed , remains inflexible unlike the brain which is capable of learning throughout life.

From evolutionary perspective the evolution of a biological organ, e.g. eyes, is easily explicable with clear survival advantages, which explains the fact that eyes have evolved independently by convergent evolution in many species. On the other hand, Chomsky argues against evolutionary explanation of the Language Faculty (FLN) and even suggests that it may even be an evolutionary challenge as it can be detrimental to the survival of the human organism .

From a different perspective, given that adequate linguistic communication without the computational complexity of UG is not only possible but real , 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, more or less on a par with the visual or digestive or immune system "(Chomsky, ibid p.2) unsustainable. Brain and mind, biological and cognitive entities are fundamentally different.

7. The argument for a close association of thought and language which places complex hierarchical thought as foundational in the organization of grammar is challenged.

The argument , highly influential in philosophical and linguistic circles of generative persuasion , states that language is primarily a system for organizing concepts and their externalization and use in communication is an evolutionary afterthought. In this context UG is the uniquely human cognitive ability to encode and organize human concepts (J. Fodor, 1975). As per Bickerton "without a system of verbal auxiliaries or verbal inflections there is no automatic and unambiguous mode of expressing time reference. ...Thinking of the kind that humans do is at best extremely difficult in the absence of syntax..." (D. Bickerton 1990, p.162-163). Thus, complex hierarchical thought is not possible without complex grammar.
 From evolutionary perspective the appearance of grammar as a cognitive property is conditioned on a pre-existing Language of Thought (LOT) and the syntax of language is a direct reflection of syntax of thought (N. Chomsky, most recently 2016 and elsewhere ; A. Reboul, 2015). In this context the goal of evolutionary linguistics should include an explanation of the LOT, which so far has not been addressed.

That said, studies in historical linguistics and typology show that there is nothing particularly indispensable about the use of grammatical forms as hierarchically organized conceptual structures can and are, in many languages and in the same language at different time periods , externalized in alternative ways (see for example B. Comrie, T. Kuteva 2005; B. Heine, T.Kuteva 2007). Thus, complex syntax is not necessary for communicating complex ideas, suggesting that there is clear dissociation of thought and language .
Moreover, it has been found that language and thought are independent properties of the human mind and damage to linguistic abilities does not result in diminished cognitive abilities (E.Fedorenko, R.Varley, 2016). In addition, common human experience shows that attempts to verbalize one's thoughts is often a struggle, further confirming the dissociation

of the two. Moreover, cognitive capacity for recursive conceptual structure, a defining property of LOT and, by association of UG, has been demonstrated in primates despite being languageless, further disputing the claim of LOT as a unique human property.

That said, although language and thought are two independent cognitive properties, these two have a complex relationship which is bidirectional: thought precedes language, but language influences thought by it making it clearer as words help sharpen concepts. (M. Donald, 1993).

Thus, thought precedes language evolutionarily, but once evolved, language facilitates thought.

8. Algorithms vs. biology: the biolinguistic argument has internal logical inconsistencies.

The Language Faculty postulated by the biolinguistic perspective is defined by the idealized version of the human individual (Chomsky 1980) and deviations from the ideal are labeled as abnormalities. 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 reality of naturally accruing living entities reveals the internal inconsistencies of the biolinguistic vision of language and mind.

The conceptualization of "normal" as " ideal" is misleading and in some occasions results in defining naturally occurring variations in human anatomy, physiology, cognition, 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 (D.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, some deficiencies in language processing do not 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" (D. Bishop 2009, p. 203). Thus, linguistic abilities cannot be measured with 1s and 0s.

Moreover, E. Dabrowska and J.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.

In addition the minimalist vision attributes 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 but just slight improvements of previous ones. S.J. Gould (1980) describes the products of evolution, as " useful imperfections". Gary Markus characterizes the human mind as a

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product of evolution as a " kluge", clumsy or inelegant, yet surprisingly effective solution to a problem" (G. Markus, 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 , perfection and evolution are incompatible notions.

Moreover, the claim of the biolinguistic perspective for the arbitrary nature of linguistic computations, (Chomsky 1980, 1995) i.e., irrelevant to the survival of its bearers contradicts the argument by S. Pinker and P.Bloom (1990) that they have evolved by natural selection. From evolutionary stand point these two arguments are mutually exclusive . 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 .

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 given that the use of modern complex grammar 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. Thus, if one accepts that the language capacity has evolved by evolutionary principles in pre-civilization environments , it cannot contain computations for complex grammar. In sum, a language capacity for modern grammar cannot be explained in phylogenetic terms.

From a different but related perspective, as far as I am aware, studies on language deficits and disorders are done on speakers of languages with complex grammars. In this sense will modern hunter-gatherers who are speakers of languages with minimal grammar and live in primitive societies be labeled as grammatically impaired and thus, abnormal humans ? Thus, theoretical misconceptions can have negative social consequences.

In this context, it must be mentioned that Jackendoff's argument (2002) for a Language Faculty providing a range of innately predetermined options of grammatical devises for individual languages to choose from is unsustainable on evolutionary grounds given that 1. evolution does not have foresight and could not have anticipated civilization and its future demands on language , and 2. evolution is generally efficient and frugal and avoids waste of resources.

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 A.Fedor, P.Itzess, E. Szathmary, 2009, p. 32; M. Christiansen, N.Chater, 2008). Ergo, direct genetic representation of grammar rules is highly unlikely and could at best be limited to some very general aspects of pattern formation.

Thus, the biolinguistic argument has internal contradictions which hamper the understanding of the Language Faculty and the 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 (A.Benitez-Burraco, C. Boecx, 2014)

9. Our understanding of the process by which youngsters become competent language speakers has been altered.

The generative approach understands this process as biological growth , i.e instinct-like , effortless, automatic and inevitable, termed " language acquisition" 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 insufficient input to language attainment by youngsters 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 (M.Tomasello 2000; D. Slobin 1982 ; G. Pulum, B. Scholz, 2002; G.Sampson, 2007 among others) present evidence that the linguistic environment is replete with examples deemed by generativists to be unavailable as stimulation for learning from experience. In short, the stimulus is quite rich and conducive to learning which explains why language attainment is inevitable. In addition, studies of infant development (G. Dehaene-Lambertz, 2017) show that children's exposure to language begins prenatally, as soon as their hearing capacities become developed enough to process them . 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 facilitates the extraction of regularities (K. Smith, S.Kirby, H. Brighton ,2003).
In sum, the " poverty of stimulus " argument is an unsubstantiated assumption and a shaky ground on which the generative 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, describing this process as fast and effortless is an exaggeration.
Chomsky and others have argued that children become fully competent speakers at a very early age, i.e.3-4 years of age while S.Pinker (1994) and other students of child development argue that full language proficiency takes a lot longer, e.g. 12 years. Given the fact 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 language attainment 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.

Moreover, the studies on language attainment, dominating the field are based on observations of children in highly civilized societies where this process happens under the influence of education and writing. To my knowledge there are no studies of language attainment in primitive societies which suggests that the study of language attainment is distorted by implicit bias from the start. This means that objective inquiries into language attainment has not even begun.

10. The assumption of the uniformity of language acquisition/attainment promoted by Chomsky (1988) has been challenged.

The claim for uniformity of language acquisition, i.e. language attainment, based on the uniformity of an innate Language Faculty, is one of the foundational assumptions, implied, not argued in detail, by the generative tradition.

That said, various empirical studies have demonstrated that individual differences in language proficiency is the norm, not the exception. Given that individuals differ genetically, these differences are reflected in language attainment. Genetically based phenotypic traits like deafness, stuttering , etc. influence language attainment as do differences in language exposure and experience (Mueller, R. A. 2009). Thus, given variation in genetics and phenotype, individual differences in language faculties are to be expected.

Even for children 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, R. A. 2009). In addition, 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 A. 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 M. 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 (E. Dabrowska, J.Street, 2006). See also E.Kidd, S.Donnely, M.Christiansen (2018)for a comprehensive review.

In short, a Language Capacity emerges during language attainment in every individual brain

in a slightly different form. That said, despite differences in cognitive development most individuals reach a comparable level of linguistic competence which makes possible the communicative function of language.

11. The traditional understanding of human species in terms of the dichotomies of nature vs. nurture or innate vs. learned, or biology vs. culture has been challenged.

It has been found that culture and biology interact and most importantly, that the human species are unique in that our evolution has been highly influenced by gene-culture co-evolution, including language evolution. (S.Pinker, P.Bloom,1990; S. Levinson, D.Dediu 2013; K. Stromswold, 2010). The finding that biology/nature and culture/nurture mutually influence one another makes the reference to these two in opposition irrelevant. Moreover, our understanding of evolution traditionally understood in terms of Mendelian genetics has been altered as more recent studies reveal a much more complex picture of interaction of genetic, epigenetic, developmental and behavioural contributions to the process of speciation. Evolution was shown to be a multidimensional process where the four dimensions interact in complex ways during different timeframes (E.Jablonka, M.Lamb, 2006) as their contributions to the formation of the organism interrelate, which makes the contributions of nature and nurture difficult to disentangle and identify with precision.

12. The understanding of language in terms of dichotomy of meaning vs. structure or lexicon vs. grammar is challenged.

The generative argument for promoting the conception of language in terms of mutually exclusive oppositions of meaning vs. structure or lexicon vs. grammar is based on the premiss of "...clear division of labour between functional and lexical items " as they argue that there is a definitive difference between the information encoded in a lexical verb (an action, state) and that encoded in its grammatical markers, i.e. to locate this action in time by tense markers, to specify its manner by aspect markers, etc.. (M. Tallermann et all, 2009, p.138).
On the other hand, corpus-based linguistic analyses reveal continuity in the semantics of linguistic items around the continuum from content nouns to forms with increasingly more abstract meanings, i.e. prepositions, tense/aspect/mode markers, definite/indefinite articles, etc. Thus, language is organized along a continuum of meanings and continuity of lexicon and grammar, meaning and structure is inherent in the language system. Moreover, forms of some level of abstraction , e.g. prepositions, depend for their existence on content words, tense/modality/aspect morphology are conditioned upon the existence of lexical verbs suggesting the internal integration of the system as a whole.
 In addition, empirical studies in language disorders, language use and attainment have demonstrated that the human mind treats lexicon and grammar as a continuum (E.Bates, J.Goodman, 1997). Moreover, the authors find " no evidence in individual children for selective dissociation between grammar and lexical development. Children who are delayed on one tend to be delayed on the other ". (ibid. p.15). These findings strongly suggest a

general pattern of strong interdependence of vocabulary and grammar in child language attainment. More recent inquiries into the representation of language in the brain confirm that both lexical words and grammatical structures are processed, stored and retrieved in the same way by the same regions of the brain (Kaan, 2009). Moreover, B. Comrie and T. Kuteva (2005) have argued that concepts usually encoded in grammatical forms almost always can alternatively be expressed in lexical words adding strength to the argument for continuity in language processing.

The lexicon vs. grammar dichotomy in the formalization of language has influenced evolutionary linguistics. It reveals crucial internal challenges within linguistics demonstrated by the two dominant perspectives. On the one hand Chomsky and some of his most loyal followers, even in their most recent publications (M.Hauser et all., 2014) define language and its evolution in terms of miracles and mysteries. These and other authors attribute a modern language capacity to a miraculous event, where the independently evolved cognitive capacities for lexicon and grammar are said to have come together at a turning point of human speciation. A version of this argument is offered by D. Bickerton (1990) who understandins language evolution as appearance of a grammar-producing cognitive algorithm overlaid onto lexicon-based protolanguage. At the same time the origins of the lexicon is generally ignored and only recently is pointed at by the biolinguistic perspective as a major outstanding issue for evolutionary linguistics (Pinker, Jackendoff 2005).

In usage-based context , on the other hand, grammar is explained as having emerged from the lexicon as an adaptation for more effective communication extrapolated from demonstrations by historical linguistics (T. Givon 2002; B. Heine,T. Kuteva 2007). Consistent with this view is the argument by Jackendoff and collaborators (P.Cullicover, R.Jackendoff 2005; R. Jackendoff, E.Wittenberg, 2014) that there is no dividing line between protolanguage and language as many languages spoken today display similarities to the putative lexical protolanguage.

Thus, empirical studies in phycholinguistics , linguistics, language acquisition, historical linguistics demonstrate the continuity of lexicon and grammar in the language system, language processing , learning and use irrespective of variation in space and in time, suggesting that it is a universal property of language. The very existence of grammar is predicated on the lexicon and the two function and evolve only as parts of a unified system of human language as a distinct entity, unmistakably different from grunts, gesticulations, songs or any other forms of non-linguistic human communication . It is definitely distinct from non-human communication.

By association, the argument for evolution of the lexicon independently of the evolution of grammar is ill-conceived as the evolution of the lexicon cannot be understood in isolation from grammar.

13. The uniformitarian hypothesis has been challenged.

To remind, the uniformitarian hypothesis argues that despite the observable variation in the structures of all languages, extant and theoretically possible languages, at all stages of their

history are essentially of equal overall complexity.

To note, the concept of complexity in linguistics is poorly defined and reflects the theoretical biases of the respective paradigms. Using terminology of computation , it is generally understood in terms of computational complexity measured in bits of information, hence, bit complexity. In biolinguistics it is defined as computational complexity of the Language Faculty, while in usage-based context it is measured by the length of the algorithms by which a grammar is described. The concept of complexity in language and the methodology of its measurement is poorly understood and will be discussed here only in passing.

The uniformitarian hypothesis has been maintained by the biolinguitsic as well as by the usage-based/emergentist perspectives , each for different reasons; the former based on the presumption of innate universal grammar (N. Chomsky, 1995; D. Bickerton,1990) the later based on uniformity of function (P. Trudgill, J. Sampson, 2009; T. Givon, 2002 ,among others) and uniformity of process (B. Heine, T. Kuteva, 2007).

Thus, although languages appear to vary widely at all levels of structure, i.e. phonology, morphology , syntax, semantics, more complexity in one area compensates for less complexity in another. In this way increase in complexity in one component is balanced by simplification in another so the overall complexity of an individual language system as a whole remains constant and all languages remain highly similar. That is, there are no simple languages.

The hypothesis is challenged by empirical findings. D.Everett 's study of Piraha (2005) reveals that it lacks grammatical forms for expressing detachment form immediate experiences, e.g. no markers of past tense, narration is limited to recounting events from the immediate past by direct observers, prompting the conclusion that Piraha language fails to display characteristics thought to be the very hallmarks of human language. D. Gil (2009) describes Riau Indonesian as a language which "represents the limiting points of maximal simplicity within each of the three distinct domains , morphology, syntax and semantics." (Gil, ibid. p. 2) .Thus, not only there is variation in complexity among languages, but there exist fully functional languages which, by the standards established by modern formal theories, barely qualify as languages.

From a different viewpoint, in the current dominant paradigms language is understood in terms of the dichotomy of lexicon as grammar and complexity is defined in terms of grammatical rules. In this context the semantic aspect of languages measured by the number of concepts encoded in linguistic forms, i.e. semantic complexity, as a contributing factor in the overall complexity of a language is ignored making the notion of uniformity of languages incomplete.

14. The "recursion only "or the discrete infinity hypothesis as a defining property of language and the Language Faculty has been challenged.

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 the Language Faculty. Stemming from the assumption of universality of the Language Faculty, serial self-embedding , or discrete infinity is assumed to be a universal property of language.

The generative claim of infinity of language 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 refuted by 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 primates' 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))) (R. Seyfarth, D. Cheney, T. Bergman, 2005)

Recursive properties are also easily detectable in human behaviours, e.g. musical compositions, visual cognition, the number system, games, social cognition, practically, all domains of human cognition, suggesting that recursion is better defined as a property of general intelligence.

M. 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, M. Ibid.).

M. 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 recursion cannot be hardwired. 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 (D. 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) 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. The authors dispute the reduction of all the unique features which language exhibits to just one as a misrepresentation of language, as, as Pinker and Jackendoff show, language exhibits a whole host of unique features , e.g. the lexicon, morphology, etc.

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 by modern linguistic thought as 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.

16. On a slightly different but related topic, empirical findings challenge the assertion by generativists that complex syntax, and specifically recursive operations, is the source of creativity in language (most recently L. Rizzi, 2009).

Creativity in Chomsky's sense is a computational procedure similar if not identical to the ones performed by computing machines, which involves constant search through the entire lexicon for the most appropriate lexical items and in each case the product is a linguistic novelty.
On the other hand, Piraha, Riau , and probably more languages to be discovered, lack recursion, this does not hamper in any way their capacity to express infinite meanings with finite linguistic tools (D.Gil, 2009) thus, demonstrating that linguistic creativity is not conditioned on recursion.
Moreover, by simple observation of linguistic behaviours of average humans, not hypothetical ideal speakers, one would inevitably notice that perpetual production of novel combinations is often avoided as speakers prefer to reuse linguistic constructions of all types, from individual lexical words to phrases and entire sentences. Moreover, the use of linguistic formulas, i.e. phrases stored in memory as holistic units, e.g. ” as a matter of fact ”, “ when all is said and done”, “ ladies and gentlemen” etc. is abundant in all spheres of language use . It is estimated that about 50% of linguistic performance consists of set phrases. (A.Wray, 2009).
This widely spread tendency to limit linguistic creativity is reasonably explicable with the limitations of the human brain as a finite biological entity given that linguistic creativity is a highly energy-consuming cognitive activity and as such is avoided giving preference to shortcuts by the extended use of energy-saving alternatives e.g. reuse of previously stored items, prefabs etc. suggesting that Turing principles of computation are not applicable to human brains.
 From a different perspective, simple observations show that creativity in language comes

from pragmatic interpretation as questions can be interpreted rhetorically as statements, statements can be disguised   as questions, negative statements can be interpreted ironically as affirmative , etc.

Moreover, creativity is a murky concept subjected to widely different interpretations by different scholars depending on their theoretical biases. In this sense the sweeping proclamations of Chomsky and like- minded linguists on linguistic creativity cannot even be subjected to empirical evaluation.

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

The usage-based/functionalist/emergentist approaches argue that processing of language-relevant functions by the adult organism are performed by mechanisms innately specialized for functions unrelated to language, which during development and under the influence of experience with language become coordinated in an emergent Language Faculty. Thus, in this context there is no innate Language Faculty. Nevertheless, empirical studies (Lieberman , Ph. 2000, 2006, 2007, 2008;T. Fitch 2010; P.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 (G. Dehaene-Lambert 2017) strongly suggests innate specifications 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 (M. Donald, 1993; M. Tomasello, 2008; T.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 (Ph. Liebermann, 2008; T. Deacon 1997). That said, the term " language areas" in reference to Broca's and Wernicke's regions, suggesting specialization for language-processing mechanisms is overstated.

Thus, the human organism clearly has some 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.

17.Recent findings challenge the hypothesis of Language Capacity as a novel and unique cognitive entity.

Instead, language is found to rely on multiple aspects of physiology and cognition inherited from ancestor species, which in the human organism were hijacked for use in linguistic communication and modified to different degrees for this new function .

Various physiological and cognitive language-relevant aspects of the human organism , previously thought to be unique to humans, have recently been demonstrated in nonhuman species, not only primates but birds, cetaceans, mammals. These include:

a. Discreteness and combinatoriality in the perception and production of the sound signal essential for the formation of phonemes and phonological systems, was thought to be unique feature of language. Nevertheless, the songs of some birds are hierarchically organized combinations of discrete sounds, i.e. demonstrating phonological syntax (A.Hilliard, S.White, 2009), thus, displaying some similarities to speech.

That said, bird songs display combinatoriality, but not compositionality as the sound combinations they produce have holistic meanings i.e. individual notes are not analogue to morphemes or words. In short, birdsongs lack double articulation, essential feature of human language.

b. Vocal learning, instrumental in language language learning by children and demonstrated by change in the structure of the sound signal of a youngster in attempt to imitate that of the parents', is found in birds, some marine animals and even bats and elephants (A.Hilliard, S.White, 2009; J. Petri, C. Schraff, 2011, p. 2125). The most relevant to language learning is the case of vervet monkeys, whose calls are mostly innate, although there is some learning involved as young vervet monkeys must learn to use their vocalizations in the appropriate context (A.Hilliard, S.White, 2009).

c. Vocal communication and learning imply adequate hearing capacities, socialization and critical period for learning. These capacities, essential for language attainment , are found in song birds. (A.Hilliard, S.White, 2009).

d. Speech-capable physiology and cognition is found in various species. Macaques (T. Fitch et all. 2016) and bats have demonstrated a complex system of vocalizations , echo-detection. Bats learn new vocalization throughout their lives, their vocalizations have dialects as markers of group identity. Moreover, they have complex social lives and their communicative interactions resemble human dialogues in turn-taking. (S. Vernes, 2017),

e. The so called " inner speech" or talking to oneself, previously considered unique to humans, has been demonstrated by various non-human species (C.Scharff, J..Petri, 2011, p. 2125,).

f. The communication of various primate species resembles to various degrees human language. Great apes and even monkeys anticipate calls to have a communicative function, suggesting a primitive form of Gracian principles of signal interpretation.They demonstrate awareness of social structure as they tailor their calls to reflect the social rankings of the receivers . Apes also produce call combinations with cumulative meanings different from the meanings of the individual calls in isolation and , in addition, demonstrate ability to

interpret calls in context-dependent way. Importantly, recursive conceptual structure has been demonstrated in primates. Primate communication , similar to human conversations, is multimodal, consisting of vocalizations, gesticulations, facial expressions, body posture (K. Zuberbuhler, 2015).

g. Some monkey species combine individual calls to create new complex meanings, suggesting some form of capacity for syntax (Hilliard, White, 2009). This, although, does not suggest that monkeys are capable of syntactic language.

h. The basal ganglia, a cognitive organ with a long evolutionary history stretching as far as mice, in non-human animals involved in motor control, walking etc. in humans, in addition to its original function, has acquired a new function of regulating speech, word recognition, sentence comprehension, mental arithmetic, etc. strongly suggesting biological and behavioural continuity (Ph. Liebermann, 2009).

j. The human speech capacities are slight modifications of Neanderthal vocal capacities and some even argue that Neanderthals were "... fully articulate beings.." and had all the necessary attributes of human language speakers (D. Dediu, V.Levinson 2018).

k. As the argument for a grammar organ explained with a genetic Big Bang was rejected on evolutionary grounds, some scholars (Pinker, Bloom 1990; Hauser, M. , Chomsky, N. Fitch, T. ,2002; R.Jackendoff , E.Wittenberg 2014) offer some form of adaptationist account which envisions a coordinated gradual adjustment, i.e. co-evolution, of a number of pre-existing aspects of cognition to language - relevant functions which culminate in a capacity for modern grammar. In this sense, the dividing line between qualitative and quantitative difference, new and old capacities, is blurred. Moreover, it is reasonable to expect that quantitative differences in brain architecture may result in qualitative difference in functions . For example , small increase in memory capacity could open an opportunity for processing of longer sentences, including coordination, subordination and recursion.

In short, although no other species display the full arsenal of language-relevant complex of biological and cognitive properties, i.e. a Language Capacity, various aspects of it are clearly demonstrated in other species, suggesting that the human linguistic ability is explicable not by some evolutionary novelty, but by the integration and coordination of old features , 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.

18. These and other findings question long held assumptions of the uniqueness of humans as articulate species.

Although genetic, cognitive, behavioural differences, significant enough to justify the conceptualization of the three branches of Homo, i.e. Sapience, Neanderthals and Denisovans as different species, nevertheless, these differences appear smaller than previously thought .

The assertion that language is unique to humans is questioned by recent findings that Neanderthals and Denisovans have language-capable bodies and minds (D. Dediu, V.Levinson 2018). Archaeological findings reveal that these species along with sapience survived and successfully exploited climatically diverse habitats and demonstrated a life style very similar to that of sapience, e.g. produced and used stone tools, clothing and footwear . Evidence of burials, diverse diet, use of medicinal herbs was also found, , suggesting advanced cognitive abilities and complex social relations . Homo Sapience, Neanderthal , Denisovans, co-existed and shared territory in Eurasia, Levant, Siberia for more that 50,000 years. In addition genetic studies reveal traces of Neanderthal and Denisovan genomes in modern human populations as evidence for interbreeding, suggesting intermarriages and resulting from that intertwined histories and cultural traditions . Further similarities in anatomy, patterns of infant and child development are detected. The recent discovery that Neanderthals shared with humans the same FOXP2 gene (J. Krause et all. 2007) suggests that the dominant view of human cognitive and communicative uniqueness may be an exaggeration. Thus, intelligent beings , biologically, cognitively and culturally compatible, would have some form of shared communication, including some form of language, quite possibly, of features comparable to human language .

Anatomical and cognitive capacities for the command of articulate speech and language, including capacity for speech perception and production, breathing and tongue control, prolonged childhood affording possibility for learning, hierarchical planning and use of recursion of thought demonstrated by control of fire, cooking, building huts, etc. in Neanderthals are found (A.Barney et all. 2012; D.Dediu,V. Levinson, 2013.). Liebermann , has consistently argued that non-human species are unable to produce the quantal vowels /i, a, u / suggesting limitations in their speech capacities, which indirectly suggests limitations in vocabulary size, and, consequently, limitations in use of grammar. Nevertheless, the latest studies show, (A.Barney et all. 2012) articulatory capacities comparable to humans' , suggesting the cognitive ability to memorize and process a large vocabulary. That said, as stipulated earlier, even small vocabulary always implies some grammar. Importantly, given that some languages of today's hunter-gatherers display relatively small vocabularies and simple grammar, (M. Cysouw, B.,Comrie 2013), one is prompted to accept that Neanderthal populations were language speakers.

From a different angle, although it is highly likely that the languages spoken 500,000 years ago (ya) by human and Neanderthal populations, probably were not as complex as modern languages of contemporary industrialized societies, it is certainly plausible to assume that they were similar to languages of modern hunter-gatherers, given the similarities of life style and small population size, characterized as " society of intimates" (see T.Givon, B. Malle, 2002), suggesting similarity of function. These include small phoneme inventory, vocabularies in the few thousands, simple grammar with abundance of irregular forms. And although the argument that non-humans were also language speakers is and will remain a conjecture, it is, nevertheless, a plausible one and a legitimate challenge to the current dominant view.

The findings of language-relevant capacities in non-human species also challenge the widely held assumption that language has appeared recently, in the last 50,000 years as

D.Dediu,V. Levinson (2013) date speech and some form of language at about 500,000 years ago , thus after the separation of Sapience and Neanderthal from the common ancestor.
To the effect that the very concept of species and species diversification implies some unique traits, the fact that humans have unique traits is nothing unusual. That said, to proclaim human exceptionality by labeling human species as a new type of a life form and a breakaway from the natural continuity of biological forms (Maynard Smith,J. Szathmary, E. 1995) based on unmatched linguistic abilities is unwarranted.

19. The concept of " protolanguage" and its continuing prominence in evolutionary linguistics is in need of reevaluation.

The concept of "protolanguage", introduced by Bickerton (1990) refers to a hypothetical pre-human communication system preceding the emergence of modern language. Although various versions of protolanguage are proposed, Bickerton's hypothesis for " lexical protolanguage" is dominant. Bickerton defines protolanguage (1990, 2003, 2014) as "lexicon without syntax" or semantically structured system organized around predication and centred on the proposition, but structurally inefficient, ambiguity-ridden and context-dependent.
The concept of protolanguage and the argument for a protolanguage stage in language evolution is premised on the following assumptions: 1. dichotomy of lexicon and grammar, 2. the modular nature of the human mind ,3. takes as a given the " uniformitarian hypothesis" 4. the catastrophic emergence of a grammar organ 5.underscores the exceptionality of human species in both our cognitive and communicative capacities and discontinuity from the rest of life forms.
Protolanguage is hypothesized as a well defined , stable communication system , a temporary , although lengthy, stage in the transformation from animal communication to modern human language and an evolutionary precursor to modern language, attributed to pre-human homo species, e.g Neanderthals.
That said, all of the assumptions on which the concept of protolanguage is premised , implicitly or explicitly, have been questioned and/or falsified by the latest empirical studies from a wide variety of fields referenced above .
Moreover, fellow linguists argue that there is no dividing line between protolanguage and modern language, as modern language contains forms initially attributed to protolanguage (R.Jackendoff, E.Wittenberg 2014) and modern and fully functional languages with features very similar to the putative protolanguage have been found in Piraha, , Riau and others.
Thus, although many, probably the majority of scholars, still support Bickerton's argument and the concept of protolanguage features prominently in hypotheses of language evolution, it is pertinent to reconsider its place in evolutionary linguistics.

20. The adoption of Darwinian principles form biology into linguistics as explanation for patterns of language change as glossogenesis is unwarranted as historical changes in languages display significant differences from evolutionary processes in life forms.

Linguists who subscribe to the usage-based/functionalist perspective explain language diversity using the conceptual framework of Darwin's evolutionary theory in terms of diversification of languages from a common ancestor in analogy of languages to species , assuming significant similarities between the two ontological types. The analogy of biological species and linguistic forms, first advocated by Darwin himself in On the Origin of Species, justifies the adoption of Darwinian principles to detect patterns of language change, explained as adaptation to new functions under changing social and historical factors. In addition, the concepts of gene, species, inheritance are borrowed directly from biology (R. Croft, 2000; S. Mufwene, 2002 and elsewhere).

That said, empirical findings of historical linguistics show that the direct transplant of conceptual machinery from biology into linguistics , defined as a social science, is unwarranted as phylogenesis and glossogenesis differ significantly. For example, phylogenesis is Darwinian, glossogenesis is Lamarckian i.e. acquired linguistic forms are transmitted to the next generation by learning, there is no inheritance of learned behaviours in life forms. In the process of inheritance/learning of linguistic forms the offsprings have active role as learners, while in phylogenesis they have no active role. In phylogenesis the genomes of the two parents are inherited in their entirety, while learners of language can choose which linguistic forms to adopt from the parents. In phylogenesis the two parents are the only genetic contributors, while in glossogenesis all community members are potential contributors.

In short,although both biological species and language systems undergo periodical changes, these follow different paths and are conditioned by different factors.

In short, as summarized succinctly by Bonfante (1946, referenced in B. Joseph, R. Janda 2003, p. 8) " Languages are historical creations, not vegetables".

These discrepancies, in part, explain the fact that the number of species in flora and fauna is in the millions, while diversity of languages is highly constrained at about 7000.

In sum, the study of language evolution has altered our understanding that :

 a. Language exists, functions and changes as an integrated system, a unified complex where all elements exist and function in coordination. Lexicon implies grammar and grammar implies a lexicon. Lexical items are processed and learned not in isolation but as part of a multilevel architecture, the language system.
b. Although languages vary significantly in grammatical complexity, even the most simple languages have some grammar.
c. Language is made possible genetically, phylogenetically, developmentally and in terms of on-line processing by the coordinated functions of the individual as body and mind. The language system is influenced by both human cognition and physiology.
d. The individual language user exists and functions only as a member of a community. Language exists, functions and changes only by coordinated interactions of multiple bodies and minds and this interaction permeates and shapes all aspects of the language complex, lexicon and grammar, structure and use.

e. Language is an activity of the individual as a typical representative of the species. All human individuals become sufficiently competent language users. This means that the human biological foundations of language, i.e. Language Capacity, although not uniform, displays limited variation which does not impede adequate use of language.

f. A highly similar level of language proficiency is achieved by individual speakers in different ways in reflection of their individuality, thus, speakers use their language-relevant resources in different ways.

g. Multiple aspects of the human organism, specialized to various degrees in language-relevant functions i.e., perception, cognition, physiology, interact in complex ways to make language possible.

h. Although various parts of the brain in both hemispheres are implicated in language-relevant functions, in most individuals with normally developed brains the left hemisphere and the Broca's/Wernicke/s regions have a crucial role.

i. At the same time the functions of language-relevant areas in the adult brain differ in speakers of different languages : the same brain regions are involved in processing syntax in some languages, and morphology in others, supporting the argument that a coordination of various language-relevant resources form an emergent Language faculty during development as a result of interaction with the linguistic environment.

j. The brain has alternative but complementary ways to process language, hierarchically and sequentially.

k. Although at present humans are the only language-capable species, it is likely that in the past currently extinct Homo species were users of some form of language, although this argument remains speculative. Thus, the presumption of human exceptionality is probably mistaken.

l. Glossognesis, i.e. changes in language systems detected in their histories is not evolution in Darwinian sense. It follows it own patterns and principles as it is influenced by different factors.

m. Language and thought are distinct cognitive capacities represented differently in the human mind, although there is partial overlap of concepts and linguistic meanings.

FROM LANGUAGE EVOLUTION TO EVOLUTION IN LINGUISTIC THEORIZING

Humanity has been curious about the origins of language since the beginning of civilization, although in the last century the topic has been subjected to neglect and even forbidden . In the decades since 1990 following the seminal paper of S.Pinker and P.Bloom "Natural language and natural selection " the evolution of language, following a long hiatus, became again a centre of attention and research. Since then empirical work in a variety of fields related to various degrees to this multifaceted inquiry have contributed debt and detail and greatly improved our knowledge of the bio-cognitive representation of language in the human organism, of its abilities for language processing and attainment, language-related disorders, the interface of language and social organization, human evolution, etc.

That said, an empirical inquiry starts with a viewpoint framed in a theory which determines the goals , methods and concepts a priori. The results of empirical inquiries are valuable not

only by advancing knowledge , but also by testing the validity of the theoretical preconceptions which framed them . Empirical inquiries into the evolution of language have been premised on the two dominant theoretical preconceptions of language, represented by the generative/biolinguistic approach and the usage-based/emergentist/functionalist approach and have become a test for these by revealing the strengths and limitations of each.

1. The limitations of the reductionist approach for understanding language and the human brain have been exposed.

In science Occam's preference for simplicity of theoretical machinery is rightfully considered the gold standard. That said, Chomsky's philosophy of reduction of the mental to physical (Chomsky 2000 and elsewhere) and reduction of living mater to chemical and physical processes, i.e. reducing living nature to " nature morte " has taken Ocam's advise to an extreme as the strive for ultimate simplicity in theorizing can lead to a slippery slope and result in inaccuracies of representation. The goal of utmost simplicity for its own sake by depicting natural language in terms of artificial digital systems and the human mind in terms of Turing machine is most clearly articulated by the Minimalist program (N.Chomsky, 1995, 2007 to name a few). Furthermore, a biolinguistic perspective has suggested that an adequate understanding of the Language Faculty in biological terms requires a reductionist approach to biology, i.e. the science of life forms be rebranded as science of abstractions, i.e. lifeless life forms. Moreover, Mendivil-Giro (2014) has proposed to reinterpret the theory of evolution to exclude the environment, and thus, natural selection, i.e., proposing to rebrand biology as science of lifeless life forms which evolve without living.

That said, these theoretical ramifications are invalidated by empirical findings which have revealed that that reductionist approach and the strive for ultimate explanatory parsimony and theoretical elegance as the ultimate goal for theory building has resulted in misrepresentation of language and the human brain and mind. In this sense Deacon rightfully remarks: " We should be highly suspicious of simple explanations for ...complex phenomena. "(T. Deacon, 1992, p.76.).

The limitations of this approach is recognized by fellow linguists.

" So, there is good reason to relinquish the " Good Old-fashioned Artificial Intelligence" treatment of the f-mind as a variety of serial and digital Turing machine, functionally quite unlike the brain" (R.Jackendoff, 2002, p.23). " ...neural computation appears to be somewhat graded, a matter of degree of activation and synaptic strength. (Jackendoff, ibid. 2002, p. 25). In addition, P.Cullicover, R Jackendoff (2005) criticize the use of mathematical methods of argumentation, appropriate for the filed of physics and adopted in the study of language, the only purpose of which is theoretical elegance and formal simplicity.

"...in physics, in particular, where the results of imposing a very demanding criteria of mathematical elegance and simplicity have been impressive and numerous. However, language is a biological, cognitive and psychological phenomenon. Its properties are not quantifiable ,..., and the kind of mathematics suited to physics is not applicable for linguistics" (ibid. p. 45-46)

The strive for simplification of complex phenomena has prompted the attempt to explain the biological foundations of language in terms of Mendelian genetics and hypothesize language genes , assuming an interpretation of the genome in digital terms and evolution in terms of gene recombinations.

That said, empirical inquiries into the role of genes in the formation of organisms, the human brain and its cognitive properties , referenced in previous segments, have found that in complex behaviours in general and in language as one of them, the role of individual genes in the formation of brain regions is by no means clear-cut. Moreover, no direct correspondence with brain architecture and properties of language postulated by the formal/reductionist theories have been found, only very vague and indirect influences of various factors acting in tandem. Further tests and experiments are likely to confirm these findings. Thus, the picture of biological foundations of language that biological sciences can realistically provide is likely to remain extremely blurred. The role of the genome and the brain in language-related functions will remain extremely imprecise, convoluted and vague. In sum, for as long as modern linguistic theorizing is based on idealizations and guided by mathematical principles of computation which require ultimate precision, biology cannot provide relevant data in support of future theories as there is a natural discrepancy between biological systems and linguistic formalisms informed by mathematical principles , the former based on inherent continuity, as opposed to the later , based on ultimate discreteness and discontinuity.

Theoretical models must reflect the properties of their object of theorizing. For linguistics this is natural language as demonstrated in the linguistic behaviour of average human language users. It is a highly complex phenomenon with features hardly similar to inorganic matter which makes the adoption of theoretical machinery from hard sciences unwarranted.

2. The methodology of introspection, widely practiced by generative theorists, is highly subjective which precludes independent verification.

In generative/biolinguistic context the universal properties of the Language Faculty, modelled after artificial languages of mathematics and logic in terms of idealizations, are empirically demonstrated by grammaticality judgements of professional linguists and often authors of linguistic theories or individuals with extensive education, who act as arbiters of grammaticality/non-grammaticality of artificially designed sentences. Thus, the standards for grammaticality, taken as a demonstration of the human universal capacity for language, are based on introspection of selected few highly atypical representatives of the species. On the other hand, the linguistic behaviour of the average normal human adult language user diverges significantly from the ideal and the atypical minority of individuals said to be its incarnations. E. Dabrowska's (1997) has demonstrated that both the comprehension and production of native speakers of English of various levels of socio-economic and educational levels of society correlate with the individual's level of formal education, e.g. manual labourers consistently misunderstand and misjudge linguistic examples emblematic of the ideal. If native English speakers, i.e., westerners living in a society where literacy is obligatory and exposure to written texts is inevitable daily experience, fail to measure to the

ideal speaker, one can assume that illiterate humans from an isolated tribe, which, in my mind, are the typical example of human language user, will diverge even further.

Thus, the generative concept of the ideal speaker and its superb linguistic abilities as a substitute to the typical human language user is highly biased and produces misleading results which excludes the possibility of independent verification, a key requirement for any legitimate scientific study. As such it is irrelevant to the study of language evolution and human speciation.

As the study of language evolution progresses from a compilation of " just so stories" based on idealizations and conjectures, the field is evolving into a legitimate scientific discipline, firmly grounded in objective observations, analysis of experience. And although lately artificial intelligence , e.g. experiments with robots, which, although deviate significantly from a human being, are applied in some complementary role to mimic human communicative behaviour and contribute to our understanding of early human experience with language by producing testable results .

In sum, progress in evolutionary linguistics demands reevaluation of these conceptual and methodological inconsistencies.

3. In usage-based/functionalist/emergentist perspectives language is defined as a cultural product and linguistics as a social science and reject the existence of innate Language Faculty of any form, thus, revealing another form of reductionism.

The usage-based/functionalist/emergentist perspectives, despite their significant contributions to documentation and description of language diversity and language change clearly have significant explanatory limitation. The usage-based approach misrepresents the bio-cognitive contributions of the human organism to language use and learning. Language is one of the most distinctive behaviours of the human species. And although communities clearly differ in the language systems they form, communication by language is universal, suggesting that at least some specific representation in the human organism must be responsible for this obvious fact. Human bodies and minds have evolved some facilitation for linguistic behaviour. Evolution must have prepared the human organism in some reliable way for the inevitability of language use as early in life as possible. Ignoring it or reducing the bio-cognitive representation of language to trivialities like memory, socialization and general learning capacities and leaving specialization to experience only proves to be a misrepresentation of the relation of language system and language user.

Thus, the existence of some properties of the human organism, specifically dedicated to facilitating language use cannot be ignored. There must be a place for biology in linguistics.

4. Reinterpreting function of linguistic forms: information and communal identity

The usage-based/functonalist approach defines language in terms of its functionality in interpersonal communication. The functionality of language is usually defined as communication of information about the environment, material, social, cultural , determining its adaptive value.

That said, various aspects of grammar in modern languages make no semantic contribution to the message. A clear example of grammatical forms with no informative value is the category of grammatical gender of nouns and adjectives into two, and some languages distinguish three, grammatical genders. For example, the fact that in many European languages the noun for SUN is classified as masculine gender and the noun for MOON is feminine gender is worthless as a source of information about the real world. Multiple redundant gender and number markings on the subject NP, object NP and the verb is also found in many languages. The double marking of negation is another example. McWorther (2001) points out that Kikongo, a language spoken in Africa, has various grammatical markers for past tenses encoding various meanings of pastness which are superfluous, i.e., make the linguistic coding of pastness unnecessarily overly detailed without adding any meaningful semantic value. In fact, the same semantic content can be expressed equally successfully in languages with complex grammars with multiple redundancies, e.g. Russian, as in languages with less such forms, e.g. English, which makes translation possible. Moreover, historical linguistics show that earlier stages in the history of languages lack such frivolous over-complications in grammars (B. Heine, T. Kuteva, 2007) suggesting that their function is other than simply dissemination of information. Such, apparently functionless, properties of language are universal.

One logical, although purely speculative explanation for this phenomenon has to do with a new function of language arising from a new stage in language evolution and of human history , i.e. the formation of communal identity. Language originated primarily as a tool for disseminating information, essential for survival in brute nature, thus, as a tool for uniting people. At a later stage in a more diverse and stratified society the need for self-determination brought the need for ethnic and cultural diversification of communities. Diversification in languages was part of this new phenomenon by introducing linguistic forms , which, although superfluous in their purely informative function, assumed a new function as a marker of identity, ethnic, cultural, social.

This dual functionality of language facilitates and at the same time constraints language diversity. On the one hand, no human group can exist in absolute isolation as even communities isolated by geography on islands have contacts with neighbouring communities. Throughout the history of humanity contacts among neighbouring ethnic groups leads to exchange of goods, information, cultural values. Exchange is only possible if neighbours can understand one another. Exchange of experiences and ideas stimulated language contact and language borrowing , increasing similarities and reducing differences, in this way placing limitations on diversification of languages.

While pre-civilization communities lived in relative isolation from one another and developed their unique identities, linguistic and cultural , civilization brought the emergence of commerce and the formation of empires which resulted in mass migration as a result of wars, slavery, colonization , etc. bringing significant transformation of communities. This , on the one hand, lead to formation of new communities stimulating language diversity, but on the other, created the demand for intense cultural exchange which prompted the proliferation of the languages of the powerful, which drove to extinction the languages of small communities, reducing language diversity. Further, the formation of new types of

communities, e.g. in colonies, created the demand for cultural and linguistic identity and the formation of new languages, i.e. creoles , creating more language diversity. So, there are factors encouraging and others constraining language diversity. Thus, although information sharing is the primary function of language in all social settings, the function of a banner of group identity is a close second. In short, language unites and divides people at the same time.

This could possibly explain the fact that there are currently about 7,000 languages known to science, and not 70,000, or 700,000. Language diversity and its limitations are a result of the balance between the two major functions of language, sharing information about the environment and a label for ethnic identity and this balance has been altered throughout human history.

In sum, a new interpretation of function by the usage-based/functionalist paradigm can answer questions for which modern linguistics currently does not have answers.

CHALLENGES
The lack of a unified theory of language as a challenge

Linguistics is a field populated by numerous competing theories of language. And although it is customary for any field of inquiry to diverge in their interpretation of the same facts and and to engage in healthy debates, linguistics is probably the only field where the diversity of viewpoints involve the very definition of the object of inquiry. In fact, the editors of the the latest edition of the Oxford Book of Linguistic Analysis (2015), B.Heine and H.Narrog have underscored in the Introduction the diversity of theoretical perspectives and acknowledged that the filed of linguistics is better represented by a list of the 32 most prominent paradigms given that little common ground can be found among them in conceptualization of language. Thus, modern linguistics is a collection of unrelated theoretical perspectives.

This suggests lack of focus of intellectual efforts and talent is, in my mind, one of the reasons why language is still ill understood. Integrated and coordinated effort is necessary to capture and formalize the diverse aspects of language, its unique identity and its inherent contradictions : its universal features and diverse idiosyncrasies , its timelessness and adaptability, its regularities and irregularities. That said, there is no indication that such coordination is on the horizon.

On a different but related point, linguistic theories are the theoretical foundation for a number of related inquiries into human cognition, ontogeny, language evolution and absence of one agreed-upon theory of language introduces confusion in these fields as, to quote Jackendoff, " Your theory of language evolution depends on your theory of language " (R. Jackendoff 2010) It is likely that this situation will continue to be an obstacle for future inquiries in these fields.

The challenge of a multidisciplinary approach

The study of language evolution must necessarily be a multidisciplinary inquiry as it

requires expert knowledge of the numerous aspects of language from a wide variety of unrelated fields, from linguistics to evolutionary theory, human cognition, genetics, to anthropology, archeology, primatology, etc. Each of these fields contributes a different angle to the understanding of the language phenomenon consistent with their realm of expertise. Thus, a large collection of scientific disciplines have collectively contributed great depth and detail to understanding language evolution by studying different aspects of the language complex. The study of language evolution requires from scholars the integration of this diverse knowledge, conditioned on detailed understanding of the conceptual machinery, methodology, hypotheses, of multiple, often distant scientific disciplines.

Paradoxically enough, despite the obvious benefits the multidisciplinary approach is not without challenges. For once, each participant field is in itself a highly sophisticated and highly detailed network of concepts and arguments, involving highly specific terminology of which non-experts have little understanding. The scholarship in each participant field is composed of experts highly competent in one discipline with strong opinions as fierce defenders pro or against competing arguments on a debated issue.
In addition, a single human brain is capable of mastering detailed understanding of one, at most two fields of expertise and at most a mediocre understanding of additional small number of related fields. This creates obstacles for scholars who, despite lacking relevant expertise as outsiders , must take a side on a debated issue as premiss for building one's own arguments, inevitably resulting in speculations and conjectures. In recognition of this difficulty S. Fisher and S.Vernes wrote " Genetics and the language sciences (2015), a review of the basics of modern genetics for non-geneticists, aimed to offer a simplified introduction into a highly advanced branch of modern science to interested non-specialists in hope to provide some intellectual common ground as a foundation for successful interdisciplinary inquiry. That said, although such simplifications are undeniably helpful in capturing the gist of a highly complex network of ideas , they are far from providing the inside knowledge and understanding to outsiders, whose work demands to evaluate the merits of competing arguments for which they lack expertise. This creates the challenge of premising one's own arguments on faulty foundation resulting in " just so stories" . As a result, the field of language evolution is an arena of multiple debates on various topics relevant in one way or another to language evolution with no coordinated conceptual framework and common goals . As each field progresses and provides new knowledge with increasing detail, it will become more difficult for outsiders to digest highly specialized knowledge from a variety of fields and to incorporate it into their work . Thus, ironically, advances in science are both a blessing and a curse for the study of language evolution.

SUMMARY AND PROSPECTS

The success of any inquiry is measured not only by the answers it provides, but also by the missteps it reveals and the new questions it poses leading to new directions in search for knowledge.

Empirical studies into the evolution of language have greatly expanded our understanding of the human genome, its role in language evolution, the architecture and functions of the brain , the role of culture in human evolution, the nature of the evolutionary process, the magnitude and limits of language diversity, etc. Empirical studies also have put in doubt some of our earlier preconceptions about the status of our species as a new type of life form, the correspondence between the architecture of the human brain and language -relevant functions, the nature of language attainment by youngsters, etc.

One can anticipate that further advances in the study of the human genome will reveal that more genes are implicated in the phylogeny of the Language Capacity and ,consequently, of language-relevant behaviours. Future studies are also likely to confirm that behavioural traits are the result of interaction of genes, epigenesis, development and learning . New understanding of the contribution of each is likely.

In addition, it has become apparent that the theoretical diversity in linguistic theorizing, although providing debt and detail for understanding language and languages of today, is a challenge for the study of language evolution. The lack of consensus on how to define language has plagued linguistics for decades resulting in endless debates among competing arguments which start by divergent interpretation of the same facts. And although debates are usually healthy in science and divergence of views should not be surprising, a debate is normally based on well established common grounds, a general agreement on the foundational concepts, goals and methods . One has to agree on something in order to have a discussion or a disagreement. A debate is of epistemic value only if is based on commonly agreed on premisses. This common foundation is currently missing in linguistics as even a definition of language is a matter of debate.

Various students of human biology and cognition , E.Szathmary, A.Fedor, (2009, p.16) to name a few, whose work relies on a clear definition of language as premise for their inquiries, have explicitly stated that the diversity of competing paradigms in linguistics contributes to the challenges in their research. In this sense the study of language evolution has highlighted some internal challenges within linguistics.

In short, a single unified theory of language is needed as a theoretical foundation for the success of a multidisciplinary inquiry in language evolution research. There is no evidence of any efforts in this respect.

In sum, the puzzle of language evolution is a long way from being solved. Given the challenges outlined here 1. the very nature of language and its multifaceted nature as the object of inquiry and 2. the deficiencies of theoretical machinery inadequate for the task at hand, language evolution will remain the hardest problem in science at least for the foreseeable future.

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