CHAPTER THREE

THE MYTH OF LANGUAGE DIVERSITY

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1. The diversity of languages as a myth

The title of this contribution is not intended to imply that diversity in languages does not exist. That languages are different is an objective fact, not a myth. What I call *the myth of language diversity* is the belief that the diversity of languages is profound and substantive enough to be considered the crucial phenomenon in the scientific study of language.

Undoubtedly, the fact that languages are different is a remarkable and interesting phenomenon in itself. Also, the study of such diversity affords a valuable perspective on the human faculty of language, and is not, as sometimes argued in certain areas of contemporary linguistic research, an argument to deny its existence.

Many readers will have noticed the implied reference in the title of this chapter to the influential paper by Evans and Levinson (2009a): *The Myth of Language Universals*. Evans and Levinson (E&L) do indeed believe that the existence of Universal Grammar (UG) is a myth that Chomskyan linguists have injected into cognitive science, something that constitutes an obstacle to the scientific investigation of language: "a great deal of theoretical work within the cognitive sciences thus risks being vitiated" (E&L 2009a: 429).

E&L react against Chomskyan universalism arguing that it distorts the reality of language, compromising realistic and meaningful research within cognitive science:

> The claims of Universal Grammar, we argue here, are either empirically false, unfalsifiable, or misleading in that they refer to tendencies rather than strict universals. Structural differences should instead be accepted for what they are, and integrated into a new approach to language and cognition that places diversity at centre stage (E&L 2009a: 429).

In the following pages I will try to show that, on the contrary, it is the exaggerated assessment of the depth of the diversity of languages what constitutes an obstacle to the ultimate acceptance of the study of language into the natural sciences.

Disdain of the diversity of languages can certainly be an obstacle to progress in our understanding of how the brain creates and uses language. But what E&L propose, in their rejection of universality, ignores important discoveries about common properties of language made over the past half century and risks throwing the baby with the bath water.

If one adopts a biolinguistic point of view, the relationship between language and languages is proportional to the relationship between life and life forms, organisms.

Of course, what we find in the physical world are organisms and not life itself. Life exists only as life forms, and it is quite true that these are notoriously diverse. But this is not to deny that life exists (e.g. in contrast to the inorganic world), or that we should consider it a secondary matter to ask which common properties define and explain it. Indeed, this is the central goal of biology as a science.

There is no reason to believe that this shouldn't also be the case in biolinguistics, unless we reject the comparison, that is, unless we reject that all existing languages are manifestations of the same faculty of language, sustaining the view that languages are essentially cultural objects, abstract tools that have evolved independently and whose essential structure comes from outside the mind and brain.

This is the most common conception of languages among researchers who belong to what we might call the *Functional-Cognitivist Paradigm* (FCP). This conception of languages, an anti-biolinguistic one, underlies E&L's approach and feeds what I have called the myth of the diversity of languages.

E&L explicitly formulate this myth as one of their conclusions:

> The diversity of language is, from a biological point of view, its most remarkable property–there is no other animal whose communication system varies both in form and content (2009a: 446)

While it is undeniable that the diversity of human languages is notable and relevant, the claim that diversity is the most remarkable property from the *biological standpoint* can indeed be challenged. This statement appears to be based on the belief that no other animal communication system

varies in form and content as human language does.[1] However, this is doubly questionable. On the one hand, it is not indisputable that human languages vary in form and content as much as E&L assume. On the other hand, it is not clear whether there is indeed no variation in other animal communication systems.[2] In addition to the known cases of whales (Payne 2000), many songbirds have dialectal variation:

> Most birds do not simply mimic the song of adults exactly: In many species, individuals create new, novel songs that are built upon but not identical to the songs they heard as nestlings. This creative aspect of birdsong ensures that each generation hears slightly different songs from those of the previous generation. This process of song transmission across generations, with slight novelties introduced by creativity and or erroneous copying, leads to 'dialects' of birdsong: Birds in different regions sing quite different learned songs (Fitch 2009b: 289).

It is difficult to consider this description without reflecting on what happens in the case of human languages, unless we apply different criteria to humans than to other species. "Language" change and diversification, then, is not so rare in the natural world. However, naturalists have not been tempted to conclude that there are organisms of the same species that have radical and profoundly different systems of communication and knowledge, except in the case of humans (as seen in the quotation from E&L, above).

It is tempting to consider this as an example of the kind of suspension of scientific rationality when it comes to studying the human being that Chomsky has frequently noted when defending the naturalistic approach to human language:

> The basic properties of humans seem to be identical, close to identical, except for pathology, which you can find anywhere. So you could investigate every individual, just like you could investigate every apple to make sure it follows the laws of motion when it falls, but nobody does that because there is so much evidence that they have to be identical. In fact it's interesting that these questions only arise in the human sciences. They never arise in physical sciences. It's all the same. Why don't they arise

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[1] In fact, according to Pullum and Scholtz, "Evans & Levinson's *major point* is that human languages are intriguingly diverse rather than (like animal communication systems) uniform within the species" (2009: 466, my italics).

[2] Of course, human languages are used for communication, but this does not mean that languages *are* communication systems (see Berwick and Chomsky 2011: 39).

> elsewhere? Because there is a kind of rationality that prevails in the study of the natural world, which is somehow cancelled when we study ourselves. At that point we become very irrational. So we ask the kinds of question that wouldn't arise in studying other aspects of the physical world —even studying other animals. (Chomsky 2010a: 30).

What Chomskyan naturalism means in this regard is that the burden of proof is on those who deny that human beings have a unique capacity for language and state that this ability varies greatly and deeply within the species. Certainly this would be a strange biological fact, unless of course we think that language has nothing to do with biology and nature.

The radical and deep diversity of languages is in this sense a myth, a myth coined on the old anthropocentric prejudice that human beings are essentially a matter of culture rather than nature, that human languages are cultural artefacts, not natural objects.

Indeed, the insistence on the plasticity of human cognition and on the power of our ability to learn cannot be interpreted but as an attempt to present human language as a phenomenon alien to the natural world:

> Structural diversity at every level is not consonant with a theory of fixed innate language structure, but instead suggests remarkable cognitive plasticity and powerful learning mechanisms. We pointed out that human communication is the *only* animal communication system that varies in myriad ways in both form and meaning across the species, and this must be a central fact that should never be lost sight of (E&L 2009b: 473)

Faced with a similar criticism of dualism by Smolensky and Dupoux (2009), E&L claim:

> Smolensky and Dupoux ignore the recent synthesis of biological and cultural evolution. Thus they assert "language is more a biological than a cultural construct." We would go further: "language is one hundred percent a biological phenomenon" (E&L 2009b: 479).

As I hope to show, this rhetorical statement hides a direct rejection of Chomskyan naturalism. The "number one enemy" of E&L and, in general, of the FCP, is the assumption that human beings have a natural capacity for language (i.e. what traditionally has been called UG). Yet, as I will discuss below in greater detail, this is a false problem, and mainly a terminological one (see also Chapter 2). The attack on UG simply disguises an assault on the consideration of human language as a natural object and, ultimately, on the idea that the human mind is also a natural object.

One possible explanation as to why a non-naturalistic conception of human beings is linked to the rejection of a naturally conditioned faculty of language (FL) would be that if we recognize the existence of such a capacity as a component of the human mind, what follows is the idea that the other components of the mind would be similar or largely identical to those of other organisms, something that is certainly made explicit in Hauser *et al*. (2002) and that collides with the anthropocentric idea that there are substantial differences between humans and other animals. As Penn *et al*. point out:

> At present, most comparative psychologists believe that the difference between human and other animal minds is 'one of degree and not of kind' (Darwin [...]). Among researchers willing to admit that the human mind might be qualitatively different, most argue that our species' cognitive uniqueness is limited to certain domain-specific faculties, such as language and/or social-communicative intelligence. We believe this view of the human mind is profoundly mistaken. In our opinion, the discontinuity between extant human and nonhuman minds is much broader and deeper than most researchers admit. We are happy to report that E&L's target article strongly corroborates our unpopular hypothesis (Penn *et al*. 2009: 463)

As we know, the hypothesis of a natural capacity for language is the Chomskyan answer to the "spectacular fact (...) that any normal human child can learn any human language, and no human language is learnable by any other extant species" (Penn *et al*. 2009: 463). As these authors ask, "why are human languages so easy for us to learn and so unthinkable for everyone else?" (*ibid.*). Chomsky's response that only humans are endowed with a human FL as part of their nature "fits nicely with the presumption that the rest of the human mind is more or less like that of any other ape" (Penn *et al*. 2009: 463). One way to reject such a conclusion, undesirable from an anthropocentric point of view, is to support the myth of the diversity of languages:

> But as E&L point out, the diversity of human languages suggests that our faculty for language relies largely on domain-general cognitive systems that originally evolved for other purposes and still perform these non-linguistic functions to this day. If E&L are right, there should be significant differences between human and nonhuman minds outside of language (Penn *et al*. 2009: 463).

E&L themselves point out, as a remarkable fact about our species, that the same set of organs (the same in all people) serve to learn and use a set

of heterogeneous and radically different languages (2009b: 479). In fact, this is a serious problem for the contention that languages are radically diverse.

To use the well known Chomskyan terminology, this would be more a mystery than a problem. But we can try to make it a problem using the logic of rational inquiry, which always suggests that behind similar but apparently diverse and heterogeneous systems (be they physical phenomena as the behaviour of fluids, natural organisms or human languages) there underlies a set of principles and parameters of variation that can reveal the root causes of similarities and, of course, of differences.

2. Inductive and deductive approaches to language unity and diversity

At least since Borsley (1991) many authors open their discussion of the uniformity and diversity of languages by citing Martin Joos' claim that "languages can vary without limit" (Joos, 1957: 96, quoted from Borsley, 1991: 1) as a counterpoint to Chomsky's position that for human languages "there is only a computational system and one lexicon, apart from its limited kind of variety" (Chomsky 1995: 170).

Haspelmath (2008) has noted that unlike generativists, "functionalists do not assume that they will find the same syntactic categories and relations in all languages […], but they expect languages to differ widely and show the most unexpected idiosyncrasies" and, consequently, functionalists "tend to agree with Joos's notorious pronouncement that 'languages can differ from each other without limit and in unpredictable ways'" (2008: 93).

The difference between these two views on language and languages can be expressed as follows: The FCP involves an *inductive approach to language*, while the Chomskyan paradigm implies a *deductive approach to languages*.

The deductive approach deals with so-called *I-language* (persons' language organs, see Chomsky 1986, Boeckx this volume) as the object of study and, as in any scientific research, the objective is to build a theory on the properties and principles governing this language organ and to discern the factors involved in its development (e.g. Chomsky 2005). As more I-languages are examined and other cognitive systems are studied, the initial theory is adjusted, always trying to increase the explanatory power without neglecting descriptive adequacy. As in the study of the motion of bodies or cell development, it is assumed that the laws and principles formulated are maximally general, and that the observed peculiarities must follow

deductively from the consideration of additional factors (whether friction, the presence of certain proteins, or parametric variation associated with certain functional categories).

The inductive approach proceeds otherwise. Here, the objects must be studied in themselves. A detailed description is made of each object on its own terms, and once the description is exhausted or completed, generalizations about possible underlying uniformity can be made.[3]

Although not in itself a conclusive argument as to how to judge the extent of diversity in language, there is no doubt that from the standpoint of modern science, the deductive model is the adequate one.[4]

The adoption of an inductive or deductive model to express the relationship between language and languages, it seems, correlates to a specific concept in science. According to the empiricist (inductive) approach, science aims to discover the causes and the nature of things; it involves obtaining mental representations of external reality. In a rationalist (deductive) approach, by contrast, science aims to translate nature into mathematical language, and involves building theories to determine the existence of things.

At least since the time of Galileo we have understood that the aim of science is not to find concepts or representations of the entities of reality, but to build mental realities (concepts and theories) and attempt to discover experimentally which of these have some basis in what we perceive.[5]

However, the differences that these two traditions show in the way they are applied to the issue of the diversity of languages is not ultimately based on different conceptions of science; rather, the different conceptions of science are inspired by different conceptions of the object of study.[6]

From a Chomskyan point of view, language is conceived as a natural phenomenon, and languages are understood as particular environmentally

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[3] As E&L remark, "D-linguists [as opposed to C(homskyan)-linguists, JLMG] prefer Boasian 'methodological relativism' –first analyze a language in its own terms, then compare" (E&L 2010: 2734).

[4] As Haspelmath notes, for the functionalist model "description is separated strictly from explanation" (2008: 93), but such a separation is simply inconceivable from the point of view of natural science.

[5] "The standard that inspired the modern scientific revolution was abandoned: the goal is intelligibility of theories, not of the world" (Chomsky 2002: 68).

[6] However, E&L are explicit in this regard: "We have no quarrel with abstract analyses per se, but we would like to see these arise inductively, and not be derived deductively from a model based on English and familiar languages." (E&L 2010: 2754).

conditioned manifestations of that phenomenon. That is, we proceed *deductively from language to languages*.

The clearest manifestation of this procedure is parametric theory. Regardless of the specific formulations that it might take, and regardless of more or less literal interpretations of certain metaphors, the basic logic of parametric theory remains strong: from common design principles, the various emerging systems respond to variations in development processes that have systematic implications, just as happens in the development of natural organisms. The only way to deny parametric theory thus formulated is to demonstrate that there is no systematic grouping of properties in the structural typology of languages.[7]

On the contrary, from a functional-cognitive point of view, we proceed *inductively from languages to language*. This model implies that languages exist in themselves and that language is a secondary concept induced from the descriptive generalizations obtained from the study of languages. This, then, is not a strictly naturalistic approach, since languages are conceived primarily as cultural objects. Not surprisingly, from this point of view linguistic universals can be seen as a myth, since for the inductive model the diversity of languages is, by definition, irreducible, languages being primary objects with their own nature.

From a deductive point of view, the inductive program is not only empirically unattainable, it is also incompatible with a naturalistic study, since it is based on the hypothesis that human languages exist in themselves as purely cultural objects that colonise the human brain.[8]

Consequently, the inductive model described by E&L (2009a, 2010) is a perfect example of how the naturalistic research of language can be hindered. In positing the exercise of a description of each language in its own terms and with their own categories ("Every language, we have said, is a thing unto itself", E&L 2010: 2737), we would be including in the universe of data only the surface forms of languages (purely descriptive entities such as "dative case in Hindi", "double object construction in English" or "clitic climbing construction in Spanish"). If the theory of language must be made starting from such a set by induction, the expectations of success are severely reduced. As Pinker and Jackendoff

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[7] Baker (2001) and Holmberg and Roberts (2010) are robust attempts to explain parametric clusters as effects of a hierarchical relationship among grammatical properties that determine other grammatical properties.

[8] To use Deacon's influential metaphor: "In some ways it is helpful to imagine language as an independent life form that colonizes and parasitizes human brains, using them to reproduce" (Deacon 1997: 111).

rightly pointed, "any survey that fails to consider the larger design space for conceivable languages is simply unequipped to specify how 'remarkable' the actual diversity of languages is" (2009: 465).

I have suggested that the inductive approach of the FCP is based on a conception of languages as cultural objects. This vision goes back to the dawn of the science of language, and is clearly reflected in the following statement by Edward Sapir:

> Speech is a human activity that varies without assignable limit as we pass from social group to social group, because it is a purely historical heritage of the group, the product of long-continued social usage. It varies as all creative effort varies—not as consciously, perhaps, but none the less as truly as do religions, the beliefs, the customs, and the arts of different peoples. Walking is an organic, an instinctive, function (not, of course, itself an instinct); speech is a non-instinctive, acquired, "cultural" function (Sapir 1921: 2).

It may be instructive to consider briefly in what ways Sapir was right and in what ways he was not. Although in other parts of his influential book Sapir speaks of language and not of speech, it is clear that if we limit ourselves to the surface, his claims are credible: if we define a language as a historically determined set of lexical items (sound/sense pairings), then he was right. In the following pages, Sapir develops a comparison between talking and walking, and he says that without a society around you, it would still be possible to learn to walk, but you could not learn to speak according to the conventions of that society, and again he is right. The point is that an I-language is obviously not simply a manner of speaking, it is not simply a collection of sound/sense pairings and a set of rules for combining them. But that's how the myth of the diversity of languages is born, from an incomplete picture of what languages are.

From a deductive point of view, I-languages are the language organs of persons. A remarkable property of the language organ of human beings (but shared with any other organ) is that it is sensitive to environmental information in the process of development and, therefore, it is susceptible to individual and group variation.

If an I-language is actually a specific and historically determined pattern of materialisation of the faculty of language, it makes no sense to rely solely on specific historical realisations to draw conclusions about the unitary or diverse nature of languages, and about the faculty of language in itself. If we move to biology, it would be tantamount to accepting the views of the traditional naturalist whilst dismissing what the molecular biologist has to say.

3. The False Problem of UG: Innatism and Emergentism

The functional-cognitive model recriminates Chomsky's postulation of a specifically linguistic and specifically human FL, arguing that it is more economical, more biologically plausible, and more consistent with standard scientific reasoning to assume that no such thing exists, and that languages can be explained as the result of general limitations of learnability, the recruitment of other cognitive systems, and functional pressures arising from their use for communication and thought. This is certainly a possibility, one which the minimalist program developed by Chomsky and followers has in fact been exploring over the last fifteen years (see chapters 1 and 2).

It could be said, then, that what has confronted the traditions in linguistic research during the last fifty years is the problem of the innate or emergent character of the FL. However, this is a false problem, a false controversy, because FL is, like any other human faculty, simultaneously innate and emergent.

The wisest way to deal with a false problem is to stop thinking about it, and I will do so here, with the exception of some brief notes to justify the apparently contradictory statement that FL is at the same time innate and emergent.

On the one hand, there is no doubt that human beings have an ability that enables them to learn and use a human language. Given that the rest of known organisms (whether natural or artificial) lack such an ability, it is fair to say that this ability is specifically human and, therefore, innate in any normal human being. As Chomsky points out,

> to say that "language is not innate" is to say that there is no difference between my granddaughter, a rock and a rabbit. In other words, if you take a rock, a rabbit and my granddaughter and put them in a community where people are talking English, they're all learn English" (2000b: 50).[9]

[9] Fitch follows this same elementary line of reasoning: "Clearly, immersion in a linguistic *environment* is not enough for spoken language to develop in most organisms. There must therefore be *something* about human children which differentiates them from other species, and this something provides one of our core *explananda* in biolinguistics. We might gloss this neutrally as 'the human capacity to acquire language'. In generative linguistics this capacity is traditionally called the 'Language Acquisition Device', and a characterization of its properties termed 'Universal Grammar'" (Fitch 2009b: 288).

On the other hand it cannot be false that human language (as a human ability) is emerging, that is, the result of the combination or the arrangement of elements that in themselves are not language. To return to our analogy between life and language, life is certainly an emergent phenomenon, but by no means less real because of this. As Stuart Kauffman puts it,

> life is not located in the property of any single molecule -in the details- but is a collective property of systems of interacting molecules. Life, in this view, emerged whole, […], not to be located in its parts, but in the collective emergent properties of the whole they create […] The collective system is alive. Its parts are just chemicals (Kauffman 1995: 18, 24).

In fact, Chomsky himself, when describing FL as a subcomponent of the brain that is specifically dedicated to language, notes: "As a system, that is; its elements might be recruited from, or used to, other functions" (Chomsky 2004: 124, fn 1). In a similar vein, Anderson and Lightfoot remark that

> even if it were to become clear that there is no real segregation between language-related and non-language-related brain tissue, it would still be useful and important to treat the language capacity as a discrete and specifiable human biological system in functional if not anatomical terms (2002: 236).[10]

And this is both useful and important here, because such "methodological modularity" is common in any scientific inquiry. Rothstein and Treves (2010) note that "evidence accumulated over the past century, but little noticed by linguists, indicates that there is no dedicated neuronal machinery to subserve complex cognitive capacities, least of all machinery specialized for language" (Rothstein and Treves 2010: 2717). In this sense, it seems that "our abilities to learn, produce and interpret language are supported by the same neural mechanisms, at the cortical microcircuitry

[10] As noted by Rooryck *et al.,* the Strong Minimalist Thesis explores precisely this direction, but this does not negate the notion of UG: "In terms of Hauser *et al.*'s contrast between FLB and FLN, the latter would then be empty and the uniqueness of UG would reside in its particular combination of traits each of which is shared with some other domain or organism. As human language differs from all other systems something (but not necessarily some thing) must be unique" (Rooryck *et al*. 2010: 2655). For an elaborated proposal of how to conceive this "something" see Chapter 2.

level, as any other cognitive function, including those (most) that we share with other mammals" (*ibid*.). Nevertheless, they add:

> While something is known about the neural mechanisms underlying, for example, visual and auditory processes, we know next to nothing about how the nervous system processes information about the relation between sounds and symbols and how complex meanings are represented compositionally in the brain (*ibid*.).

Although we can infer that cortical transactions behave the same way in language as in other, better understood functions, "how they sum up to produce the faculty of language, and why they should do so only in the human species, remains unclear" (*ibid*.).

The solution proposed to address this mystery is simply to accept that language, as an emergent system, may have its own properties, so that linguistic structures themselves will be the result of a particular organization and accumulation of neural processes that are necessarily (and inevitably) more basic:

> The mystery may stem precisely from the nature of language as an emergent property, its being more than the sum of its parts, arising, that is, by the system-level combination of elementary cortical operations. From such a perspective, the central question for cognitive neuroscientists is what neural mechanisms can facilitate compositional interactions, and how the range of grammatical structures emerges from a much narrower range of neural mechanisms. Further, what is the nature of the plasticity which allows children to acquire a native-speaker linguistic competence in a finite time; that is, how do children learn to manipulate a finite set of symbols in such way that they can produce and interpret an infinite number of novel strings and thus convey and comprehend new information (Rothstein and Treves 2010: 2717-2718).

A similar view is that of Marcus (2006), who suggests that the possible mental organization in cognitive (or functional) modules can be relatively independent of the modular organization in neurobiological terms, while the possible neurobiological modules may themselves be relatively independent of genetic modules (see Benítez-Burraco, this volume).

Of course, there is a lot of research to be done to determine the shape, nature, extent and evolution of the principles governing the origin, development and use of the language faculty (as the other contributions to this volume clearly reveal), but it does not make sense to focus the controversy in terms of *a priori* ideas about the false issue of innateness and emergence of FL.

It is reasonable to think that certain principles will be specifically linguistic (specifically human) at certain levels of discussion and knowledge, and that such principles will have to be reduced to other principles that, at a given time (and necessarily) will cease to be specifically human and specifically linguistic. It is also expected that there will be some dispute over what evidence we need to consider in addressing the question of whether we can go from one level to the subsequent levels of reduction (see Boeckx, this volume). But to infer that there is no human FL is an illicit step that would certainly be detrimental to any naturalistic study of language (unless of course one thinks that language is not is a natural object, which is the idea underlying the FCP).

If we define UG as the initial state of FL (the human capacity to learn language in Fitch's terms), that is, as the set of natural principles (whether genetic or not, whether biological or not) that determine the architecture of human languages and limit their ranges of variation, UG by definition exists. Of course, it could be argued that the very definition of UG, which claims that these principles are specifically linguistic (in fact, specifically grammatical, if we stick to the literal interpretation of the term) is the problem. This is Tomasello's objection:

> For sure, all of the world's languages have things in common, and E&L document a number of them. But these commonalities come not from any universal grammar, but rather from universal aspects of human cognition, social interaction, and information processing–most of which were in existence in humans before anything like modern languages arose (Tomasello 2009b: 471).

Here we face two separate issues: one mainly terminological and the other conceptual.

The terminological problem has to do, clearly, with the meaning of the expression *Universal Grammar*. Note that Tomasello does not reject the notion that there are language universals, but that the properties that explain them are specifically linguistic:

> Why don't we just call this universal grammar? The reason is because historically, universal grammar referred to specific linguistic content, not general cognitive principles, and so it would be a misuse of the term. It is not the idea of universals of language that is dead, but rather, it is the idea that there is a biological adaptation with specific linguistic content that is dead (Tomasello 2009b: 471).

But we can ask what is meant by "a biological adaptation with specific linguistic content": Does it mean that there would be genes that specify

grammatical categories? Or that there would be parts of the brain dedicated to language and whose removal would leave intact the rest of cognitive and motor faculties? Or that there would be linguistic neurons and nonlinguistic neurons, just as there are pyramidal and spherical neurons? No one seems to have defended such a position. The idea of a "biological adaptation with specific linguistic content" is a straw man. Innatism refers to the bias that the body and the laws of nature underlying its anatomy and physiology impose on the systems of knowledge that are developed. If everyone agrees that this bias exists, then the dispute is meaningless.

Most certainly, UG is a heterogeneous set, since it may include restrictions derived from the principles that govern brain development and even purely formal principles that apply to every system of memory and computation (Chomsky's third factors). The notion of UG, although for historical reasons it alludes to grammar (in the sense used by philosophers of the eighteenth century), does not presuppose that each and every one of the principles that form it have to be specifically linguistic.

The question of which of the principles governing the formation of LF in each person are specifically human and specifically linguistic is an empirical matter that cannot be resolved prior to the determination of what such principles are. The distinction between FLN and FLB of Hauser *et al*. (2002), and the factorialisation formulated by Chomsky (2005) (which is common in developmental biology) are simply attempts to make this more explicit in the investigation of FL.[11]

E&L concede that it is more of a terminological problem than a real one, and they themselves suggest talking about the human capacity for language, avoiding the term UG:

> To make this crystal clear: UG/FLB must include all the infrastructure for language including the neuroanatomy for speech and cognition, theory of mind, statistical learning capacities, and all the communicative and cooperative motivations and interactional abilities special to the species [...] If all this is agreed, it is time to change the terminology and avoid all the theory-laden terms used so far. We would urge our colleagues simply to talk about *the human capacity for language* (including language-special

[11] In the programmatic terminology put forward in Hauser *et al*. (2002) the computational system and the interfaces would be part of the faculty of language in the narrow sense (FLN) ("only the core computational mechanisms of recursion as they appear in narrow syntax and the mappings to the interfaces" (Hauser *et al*. 2002: 1573) and SM and CI systems, along with other potential components and FLN, would form the faculty of language in the broad sense (FLB).

> aspects of cognition, if any) and the ingredients or elements that may contribute to that – the rest carries too much baggage, as the field advances rapidly beyond the creaky old baggage train (Evans & Levinson 2010: 2742, my italics).

However, as I noted above, the question is not whether linguistic principles and structures may be reduced to more basic principles and structures (and ultimately to neuronal structures), but when, how and at what level the reduction can be done without ceasing to account for the structure of languages. The model E&L support skips a stage, so to speak, the stage of linguistic theory itself. Among the detailed (albeit superficial) description of the structure of languages and the general cognitive principles that E&L mention, there is a vacuum of explanation, and this diminishes the scientific value of the model they defend and contributes to the unfounded myth of the diversity of languages.

Although it may seem paradoxical, in the study of language we must be both nativists and emergentists; in this there is no choice. The difference between those who claim one or the other is a matter of their optimism regarding our capacity to understand emerging systems and of the degree of compliance we have with the formal and abstract structure of human languages as systems of knowledge, which is not uniform among different traditions.

In fact, a real problem behind this false controversy is that a large number of linguists and cognitive scientists ignore or simplify the formal structure of languages, that is, the system of knowledge which is materialised in each particular language. One might ask why some linguists assume that the structure of languages is learnable from environmental data and others say that it is not. It cannot be because we do not know what is and what is not learnable. We know, at least since Post (1944), that there are things that cannot be learned from a sample by induction and others that can. The difference of opinion emerges from the fact that we see the structure of languages and the very nature of language in different ways.[12]

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[12] As Rizzi notes, "much of the typological tradition discussed by E&L has chosen to stick to an extremely impoverished, non-abstract descriptive apparatus, a legitimate methodological decision, but one which severely restricts the possibility of capturing forms of invariance." (Rizzi 2009: 467). In a similar way, Safir maintains that "it is hard to see how E&L's commitment to superficial linguistic analysis would recommend them to be a better partner for the broader enterprise of cognitive science than those who are committed to discovering what people know

The shallowness of functionalist/cognitive models of the structure of languages (as systems of knowledge) is perhaps the cause of the confidence in the possibility that induction and analogy may be an adequate means of extracting the information needed to develop such systems of knowledge (for a critique of this position see Yang 2009).

But as I have argued, the problem is not only terminological, nor does it only involve degrees of optimism and professional rivalries. It may be instructive to return now to the final statement of Tomasello's cited objection, that is, that many of the factors that determine the unity of language (including universal aspects of human cognition, social interaction, and information processing) "were in existence in humans *before anything like modern languages arose*" (my italics). Note, however, that in this Tomasello is implicitly assuming that human languages emerged externally to such "previous factors", that is, that human languages are cultural collective inventions or discoveries, objects external to the mind and the brain.

In this externalist context it is conceivable then that there are profound and substantial differences among languages, within the loose external frame determined by such factors, which are considered extralinguistic by definition. If we deny the existence of UG (i.e. the initial state of FL), then we are denying that humans have a bias towards language, that is, a specific capacity to learn the language from the environment, and that this specific capacity inevitably determines its structure. This position would then involve the theoretical possibility that different languages can activate different general cognitive systems or use cognitive systems differently. In such a case, it would not even be justified, as E&L suggest, "simply to talk about the human capacity for language", as there may be various human capacities for language. Such a possibility is suggested, in fact, by McMurray and Wasserman (2009) in their laudatory review of E&L (2009a):

> Yet, just as there is no universal structure, there may be no universal learning mechanism responsible for language. Language is a behavior assembled by many processes, an assembly guided by the language being learned (McMurray and Wasserman: 2009: 459).

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about the language that they speak, including what is abstract, and necessarily beneath the surface of linguistic phenomena" (Safir 2010: 2725).

As we discuss in more detail in section 6, this is the gateway to linguistic relativity as an unavoidable consequence of the externalist approach to human language.

4. A note on the minimalist UG and the universality of syntax

To some extent it could be said that the externalist approach of the FCP is converging with some developments of the Minimalist Program (MP), in the sense that the MP (see Chomsky 2007, Boeckx, this volume) in effect implies a severe restriction of the notion of UG, and an increase in the weight attributed to non-specifically linguistic factors in the explanation of language structure. This resemblance, I suggest, is only superficial.

Although in some areas convergence does occur, for example in the tendency to commit to language processing and use factors the explanation of structural typology and other aspects (Newmeyer 2005, Boeckx 2011a), the fact is that the MP remains fundamentally internalist and naturalist in its development and, contrary to what happens in the FCP, the MP also postulates a restrictive conception of what is a possible human language.[13]

According to current minimalist research, a language is not an inventory of morphemes and words and a set of grammatical rules, but a common computational system (what Hauser *et al*. 2002 call *Narrow Syntax*) associated through (at least) two systems of interface to respective components of the mind (at least the sensory-motor system, SM, and the conceptual-intentional system, CI).

We might call this approach the *Universal Syntax Hypothesis* (USH). According to USH, all languages would share the same (narrow, internal) syntax and the structural differences between them would be the consequence of differences in the externalisation of the computational system in connection with the SM component.

Chomsky has formulated (Chomsky 2010a, 2010b, Berwick and Chomsky 2011) the hypothesis that there is a crucial asymmetry in the relationship between FLN and the other essential components of FLB (CI

[13] Arguably, in terms of Chomsky's (2005) three types of factors that determine the development of language, the P&P model relied more on type 1 factors and the MP model on type 3 factors. In other words, the P&P model had endorsed a more geneticist "environment" of the biology of the time (years 1970-1990), while the MP echoes the developmental biology revived in recent decades (see Benítez and Longa 2010, and Longa and Lorenzo, this volumen).

& SM), in the sense that the evolution of FL in the species would have favoured the relative transparency in the connection of the internal syntax with the CI system at the expense of the connection between the internal syntax and the SM system. Such asymmetry would then imply that the main source of variation among human languages would be in the connection between the internal universal syntax and the SM system, i.e. in the externalisation of language[14].

The following quote from Chomsky, neatly—and informally—summarizes this point of view and sets it in relation to learning and language change:

> But what about the relation between this internal system and the sensory motor system? That's the externalization problem. Well, the sensory motor system had been around for hundreds of thousands of years. It's a completely separate system. It has nothing to do with this internal entity. So there is a hard problem to solve. How do I relate that internal system to the sensory motor system for externalization? Well, it's a hard problem and in fact if you look at language, that's where practically all the complexity of language is. When you study a second language, about all you study is externalization. You study the sounds, the particular lexical choices, which are arbitrary, the inflectional system, you know, how to conjugate verbs, some facts about word order, and so on. That's just about all you have to learn. You don't have to learn the syntax and the semantics because that's there already. That's part of your nature and probably it's part of your nature because that's the way physical laws work. It's meeting conditions of computational efficiency—or so we would like to show. The externalization systems are overwhelmingly—maybe, some day, we will discover *entirely*—where languages differ from one another. The wide variety of languages is almost entirely, maybe entirely if we know enough, in the externalization process, the secondary process of getting it out into the sensory motor system. That's also where languages are very susceptible to change, so say teenage jargon or invasion or something else. That's where languages change a lot. That's where they vary. (Chomsky 2010a: 20-21).

The crucial idea is that the interfaces between this universal (human) syntax and the rest of the components of language (mainly the S-M one)

[14] Sigurðsson puts it this way: "much as there are no direct mappings of morphological features onto phonological features or sound waves, there do not seem to be any one-to-one mappings from syntax onto morphology or onto PF in general" (Sigurðsson 2009: 179). See Boeckx (this volume) for a specific articulation in this line of reasoning.

are different for each human being, because they are sensitive to external experience during their development (the type 2 factor), and therefore they are grouped culturally. But note that if we claim that languages are essentially different, then we are identifying "language" with the historically modified interfaces, that is, we would be excluding from the definition of language that which (hypothetically) is common to all of them, hence making the claim that they differ sharply a trivial one.

If we substitute for the question *how deep is the diversity of languages?* the question *how deep is the diversity among species?* it is easier to perceive that there is no clear and objective answer.

If one focuses on the external phenotype (e.g. body size or nervous system) the difference between an orang-utan and an earthworm is enormous. If we continue down to the embryonic level, similarities increase and differences decrease; at the genetic level the degree of similarity is even greater, and if we jump into the biochemical mechanisms that drive cells, we reach indistinguishability. If we really are to take seriously the naturalistic approach, the same logic should be applied to languages.

It is quite possible that the human genome specifies very little about what is a possible human language (see Benítez-Burraco, this volume), but it is also true that the genome specifies little about what is a possible human pancreas. In spite of this, each human ends up having a pancreas essentially homogeneous in the species, because the development of this organ (as that of all the others), in addition to being genetically bounded, is strictly constrained by epigenetic and environmental factors and, of course, by principles of development, biochemistry and physical laws. The language organ does not escape this logic, although among the "environmental" factors there is plausibly much greater variety (see Longobardi 2003). However, when biologists talk about the influence of the environment on the developmental process, they are referring principally to the environment of the cell, not to the environment of the organism, which has an undeniable influence, but a far more mediated one. The same applies to language. The environmental (non-genetic) factors that regulate language development are also (but not exclusively) internal to the brain and internal to the language faculty, in the broad sense. It is precisely in these factors where we should look for language universals (and probably for typological tendencies), and not in the ultimately derived languages, that is, in the different patterns of materialisation.

5. The Naturalist Approach: Languages as natural objects

Nineteenth century historical linguistics was not unfamiliar with the identification of languages and natural organisms, or with the consideration of linguistics as a natural science. The best known and most relevant formulation is that of August Schleicher:

> Languages are organisms of nature; they have never been directed by the will of man; they rose, and developed themselves according to definite laws; they grew old, and died out. They, too, are subject to that series of phenomena which we embrace under the name of 'life'. The science of language is consequently a natural science; its method is generally altogether the same as that of any other natural science (Schleicher, 1863: 20-21).

Although this paragraph has subsequently been rejected and even ridiculed (see, for example, Keller 1990), in my opinion it should be considered a historical precedent for what we now call biolinguistic research.

In fact, when we address the problem of uniqueness, diversity and change in languages from the current biolinguistic standpoint, the comparison between languages and natural species is no longer the illustrative analogy it was for Darwin, but an important source of inspiration.

An I-language is a person's language organ, his/her faculty of language. Therefore, there are not around 6,000 languages in the world, but billions, as many as there are people (in fact many more, given that in the brains of bilingual people are more than one I-language).

The only real, existing thing, from the biolinguistic point of view, are those billions of I-languages. Everything else (varieties, dialects, languages, families, etc..) are abstractions that we make by grouping I-languages according to their resemblance or their historical origins. The same is true in the biological realm: what exist are the emerging states of matter that we call life forms, the organisms (the billions of animals, plants, fungi, etc. that live on the planet), whereas varieties, species, families, kingdoms, etc. are abstractions we make on the basis of genetic and morphological similarity and historical origins.

Thus, an I-language is a historically modified natural object. And this is exactly what natural organisms that are grouped to form natural species are: historically modified natural objects.

Darwin used the analogy between languages and species in order to illustrate the theory of natural evolution, using findings from the historical

linguistics of the time, especially to strengthen the idea that the similarity between similar systems could be explained as an inheritance from a shared common ancestor (see Alter 1999, Mendívil-Giró 2006, 2009). In his use of this analogy, which is more explicit in *The Descent of Man* than in *The Origin of Species*, Darwin identified species with languages, and organisms with the components of languages (words, sounds). Most modern versions of the analogy between languages and species are based on this type of correlation between the two orders (language = species, component of a language = organisms). This is not so in the case of Schleicher. In his aforementioned review to the German version of *The Origin of Species,* he deals with the correlation as follows:

> The species of a genus are what we call the languages of a family, the races of a species are with us the dialects of a language; the sub-dialects or patois correspond with the varieties of the species, and *that which is characteristic of a person's mode of speaking* corresponds with the individual (Schleicher, 1863: 32, my italics).

What Schleicher mentions as "that which is characteristic of a person's mode of speaking" is the closest definition that could be formulated at the time of the concept of I-language. And, indeed, the most appropriate terms of comparison are those that identify, on the one hand, I-languages with the organisms that form a species, and, on the other, E-languages (understood as a populations of similar I-languages) with species.[15]

But this language organ, in addition to being a natural object, is also a historical object. The language organ of a person who speaks English is different from that of a person who speaks Spanish: both share (allegedly) a fundamental design, which conventionally we call UG, but differ because of contingent events that can only be explained historically. Migrations, divergent changes, borrowing and isolation have produced two different natural objects (actually, millions of them, as many as there are speakers of both languages). But it is important to note that the very fact that the I-language of an English speaker and the I-language of a Spanish speaker are historically different should not make us think that they are purely historical objects, just as a horse and a buffalo are different historical objects, but are not purely historical, but also natural.

[15] Of course, there are other definitions of E-language (see Chomsky 1986), but the only one relevant for our purposes is that of E-language defined as a population of similar I-languages.

A linguistic species (like a natural species) is a population, a group of individuals with enough similarities. The degree of this necessary similarity is determined by viable reproduction, in the case of natural species, and by mutual intelligibility, in the case of languages. And in both cases it is a diffuse and somewhat arbitrary border. In the case of species, fertile reproductive potential depends on a very pronounced morphological and genetic similarity between two individuals; in the case of languages, mutual and fluent intelligibility depends on a very pronounced lexical, grammatical and phonological resemblance between two language organs.

The comparison works because (as argued by Pinker 1994, Chapter 8) the evolutionary mechanism is based on the same principles: inheritance, mutation and isolation. Heredity explains that organisms resemble their descendants (lions breed lion cubs, not chicks). Mutation explains that descendants are not exactly identical to their progenitors. Replication is imperfect. Genetic mutation and other factors generate variation among organisms, and it is through the variation of organisms that natural selection operates. Isolation prevents natural selection becoming homogenous in all populations, and results in the unequal distribution of variants among different populations.

The case of languages is just the same; children speak the same language as their parents (assuming that they raise them), but not exactly the same. Sometimes reanalysis (or errors) generate variation, and it is variation that feeds the social selection that leads us to adopt new forms and transmit them, along with traditional ones, to successive generations. Physical and social barriers prevent the homogenization and levelling of the relative frequency of variants.

The meaning of the term *evolution* in evolutionary biology is not (or should not be) improvement, optimization or refinement, but simply the differential transmission of certain variants over others. And the same should be applied to languages. This is crucial, but has not always been well understood. Many of the comparisons between the evolution of languages and species that have been made after Darwin have been in the wrong direction because they were often inspired by an incomplete view of the theory of evolution, according to which adaptation to the environment is all we need to explain the actual structure of living beings.

Indeed, the comparison between I-languages and natural organisms could be (and has been) used from the anti-universalist standpoint to justify the myth of the diversity of languages, in the sense that there is a noticeable difference in the structure and way of life between (at one end) a bacterium and (on the other) a human being with a brain composed of about one hundred billion (10^{11}) neurons. And because of that I think the

comparison is legitimate, in that the diversity among languages is as remarkable and significant for the study of language as the diversity of species is for the study of life. The way in which languages differ is, then, an excellent source of information on how the brain constructs, processes and uses language.

It is noteworthy that from the phenotypic point of view life forms are extremely varied, but it is also true that all forms of life use exactly the same chemical processes and biological mechanisms to develop, metabolise, reproduce, and die. Compared to inorganic objects, forms of life are fundamentally similar. To dismiss or underestimate the biological and natural foundation of language would be comparable to renouncing the discovery of the basic principles of life in favour of a descriptive analysis of living forms and of the induction of certain patterns or processes common to all of them. Nobody, of course, proposes this in the sphere of life sciences, but in language science this is indeed the case.

As we have seen, E&L (2009) propose as an alternative research program to the biolinguistic one, a model in which "the natural" is first separated from "the cultural", and then it is denied (rightly) that there are exceptionless universal properties in the phenotypic realization of languages. E&L accuse some of their critics of using a definitional notion of UG, rendering it unfalsifiable (2010: 2741), but they in fact do the same in the opposite direction: they consider a priori that human languages are cultural systems, that is, they exclude from the very concept of language the natural conditions that it can have, given that in their model such conditioning is by definition language external. Therefore, the notion of language with which they operate is partial: the result of segregating biological invariants from what is subject to historical development. It is hardly surprising, then, they fail in their attempt to find linguistic universals.[16]

Returning to our analogy between language and life, we might say that E&L do not find the common basis of life because they do not look for it in biochemistry, in the principles of self-organization, in the laws of development or in epigenesis, but in genes and phenotype, where they

[16] Baker (2009) notes that each language he studies is a source of amazing diversity and of striking uniformity, and points out that E&L fail to find true universals because they "are looking at only one side of this paradox" (Baker 2009: 448).

cannot exist, since this is the domain of the contingent historical events that have singled each species (and each language).[17]

In a way, we can say that the model suggested by E&L to address the problem of uniqueness and diversity of languages is an incomplete one that reproduces the same limitations that characterize the neo-Darwinist model of natural evolution. Neo-Darwinist biologists tend to downplay the sources of order and structure of organisms other than the adaptation by means of natural selection. And in the same vein, functional-cognitive linguists tend to downplay the principles that determine the uniformity of languages, and identify as sources of the observed uniformity those principles derived from the functions (adaptations) for which language is used.

6. The long shadow of neo-Darwinism: Languages as cultural objects

Stephen Jay Gould (1996, 2002) has described the fundamental difference between the neo-Darwinian model and its alternatives through the metaphor of the billiard ball against Galton's polyhedron. According to the neo-Darwinian point of view, an organism could be represented as a billiard ball in motion. Each time the cue hits the ball there is a variable and distinct movement; there is variability and it is a free variation that might go in any direction. The cue hitting the ball represents natural selection, and the ball goes where selection drives it. This constitutes, in Gould's terms, an *externalist*, *functionalist* and *adaptationist* theory. By contrast, the anti neo-Darwinian point of view presents the metaphor differently. The organism would not be spherical, but a polyhedron resting on one of its faces. Of course, it remains necessary for the cue of natural selection to hit the polyhedron (if not, it will not move), but once the cue hits it the prospects for change are very constrained: it is a polyhedron, which has a certain internal structure that limits variation, so that certain options are more likely than others and some are impossible, however interesting they might be from an adaptive point of view.

[17] As noted by Duffield in response to E&L (2009a), "no matter how deep one digs into mature grammatical systems, there is no logical reason to expect that one will excavate UG in any recognizable form, any more than one should discover universal principles of embryology through an in-depth study of mature organisms" (Duffield 2010: 2675)

Gould and numerous other authors do not deny natural selection and its importance as a mechanism, but suggest that we must also make a thorough study of the influence of negative restrictions (and/or positive channels) on Darwinian adaptations. As pointed out by Kauffmann, "biology since Darwin is unthinkable without selection, but may yet have universal laws" (Kauffman 1993: 25).

What is at issue is not whether Darwin was right, but whether he was absolutely right, that is, if the distribution of the morphology and structure of life forms is simply the result of adaptation through natural selection, or whether other factors that place limits or somehow channel the evident work of natural selection are also in operation. As suggested by Kauffman, the matter is that "we do not understand the sources of order on which natural selection was privileged to work" (Kauffman 1993: 643).

It seems clear that E&L's eulogy of diversity fits more in the conception of languages as billiard balls, and that the Chomskyan universalist approach equates more readily to a vision of languages as Galton's polyhedrons. Although not specifically an argument in this debate, it is important to note, as made in the previous chapters, that modern evolutionary biology tends to encourage the pluralistic view of evolution than that brought about by the neo-Darwinist new synthesis[18].

Obviously, from a functionalist point of view what matters is the function. The function to be satisfied is more important than the means employed to satisfy it. This predicts a scenario where linguistic changes are restricted only by the functions that must be met for communication and thought, which in turn would imply that languages can diverge freely provided that the functions entrusted to them are met. Thus, from the externalist, functionalist and adaptationist view (to use Gould's characterisation), a language is by definition a historical object that has been created by its development through successive adaptive changes.

On the contrary, from an internist, formalist and non-adaptationist viewpoint, a language is, of course, a historical object (affected by the Basque substrate, the Norman conquest, etc.), but it is also a natural object with an 'ahistorical' structure which marks boundaries, the roads opened

[18] "Pluralism, instead of the belief in the omnipotence of natural selection, is the norm in evolutionary biology today. (...) Obviously, natural selection only serves as a filtering condition on preexisting variations, and the primary question is how these variations first came into existence. In other words, arrival of the fittest, instead of survival of the fittest, is the core issue in any evolutionary study" (Narita & Fujita 2010: 364)

or closed to changes. This model predicts that linguistic changes are superficial, and therefore also predicts a restricted range of language diversity.

Given that for E&L languages are essentially cultural historical objects, the patterns of similarity among languages must be explained either by shared historical heredity, or by evolutionary selective pressures *external* to the evolving systems:

> To the extent that there are striking similarities across languages, they have their origin in two sources: historical common origin or mutual influence, on the one hand, and on the other, from convergent selective pressures on what systems can evolve. The relevant selectors are the brain and speech apparatus, functional and cognitive constraints on communication systems, including conceptual constraints on the semantics, and internal organizational properties of viable semiotic systems (Evans & Levison 2009a: 446).

Note that in the absence of further specification, this statement cannot be false. This amounts to saying that the explanation of the structure of organic beings must be the result of natural selection, the laws of self-organization of organic matter, development principles and physical laws. The central issue (both in biology and in linguistics) is to define what degree of restriction changes present, be they evolutionary (in the case of natural organisms) or historical (in the case of languages).

As regards evolutionary biology, Gould makes the central question clear:

> In what ways does the skewed and partial occupancy of the attainable morphospace of adaptive design record the operation of internal constraints (both negative limitations and positive channels), and not only the simple failure of unlimited number of unconstrained lineages to reach all possible position in the allotted time? (Gould 2002: 1053).

Gould argues strongly in favour of the first option, on the basis, among other arguments, of the discovery in modern genetics of a deep homology between taxonomical types separated by more than 600 million years. These types share many ontogenetic channels based on levels of genetic retention (e.g., so-called Hox genes) that a neo-Darwinian model would consider implausible, given the alleged capability of natural selection to

modify any line in a single direction according to its long and contingent history.[19]

Not surprisingly, E&L (2009b) argue, contrary to the claim of Pinker and Jackendoff (2009) that languages actually occupy very partially the space of conceivable design, that such partial occupation could be a consequence of the fact that languages have not yet had time to develop certain ways, given the short time they have been evolving (about 100,000 years, according to the authors).[20] It is impossible to judge this argument, since there is no way of knowing objectively whether 100,000 years is a long or short time span. It is, though, instructive to see how E&L, perhaps inadvertently, align themselves conceptually with the neo-Darwinian point of view, according to which the evolutionary process is limited externally and not internally to the evolving system itself.

In fact, the neo-Darwinian idea that the methodology of evolutionary theory can be applied wherever any dynamic system exhibits random variation, selection between variants and differential inheritance, is probably correct and, as I have shown, is clearly applicable to languages. Yet this does not mean that there is only one way of conceiving of the methodology of evolutionary theory, or that there is only one way to think of languages as dynamic systems with random variation and differential inheritance.

In the tradition represented by Deacon (1997) and Hurford (2002)[21], to which E&L's programmatic article is definitely indebted, when they speak of a language as a dynamic system they are actually talking about E-language, while I-language is a mere reflection of the former in the brains/minds of speakers, who merely transmit it with changes.

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[19] As Benítez-Burraco and Longa (2010) point out, Mayr noted more than forty years ago that "much that has been learned about gene physiology makes it evident that the search for homologous genes is quite futile except in very close relatives" (*apud* Benítez-Burraco and Longa 2010: 310). These authors identify this view as "different genes for different animals". They also note that "for more than a century, biologists had assumed that different types of animals were genetically constructed in completely different ways", while "Evo-devo has shown (...) that such a contention was unjustified" (Benítez-Burraco and Longa 2010: 310).

[20] "The earliest modern human remains date back to about 200,000 BP, and outside Africa date from only 100,000 years or so ago. If that is the date of the great diaspora, there has been relatively little time for diversification" (Evans and Levinson 2009b: 477).

[21] See the works collected in Briscoe, ed. (2002) for an overview of the model. Hurford (2002) calls this tradition as the "expression / induction" model.

Although in some ways the analogy is appropriate, in the sense that language change occurs through iterated learning processes, the problem is that the object of study is located *outside* speakers. E-language is identified with the species, but there is no clear equivalent of the natural organism, the individual forming the species.

A conclusion that the authors of this tradition share (Briscoe 2002: 10) is that languages evolve to adapt to acquisition requirements, a surprising way of seeing the issue that again illustrates that we are operating with a biologically inconsistent view of E-language, as an external object or as a set of sentences, and not as a population of I-languages. This approach may sound appealing, but in the end it is unacceptable, since it would be analogous to claiming that natural organisms have evolved to be expressed by DNA. Obviously, DNA is not part of the environment to which organisms adapt, and in the same way acquisition requirements imposed by human brains are not part of the environment to which languages adapt, unless we claim that languages are objects outside the brain and not properties/states of the brain itself. Indeed, such is the case with Deacon's influential theory of brain and language co-evolution:

> The extra support for language learning is vested neither in the brain of the child nor in the brains of parents or teachers, but outside brains, in language itself (Deacon 1997: 105).[22]

Let us imagine a stone channel through which water circulates. Of course we can say that water is adapted to the shape of the channel, but it would be surprising if we were to ignore that the channel structure also strictly determines the form water adopts. Notice that the problem is not whether learnability requirements are general or are specifically linguistic (a difficult and central issue, but ultimately an empirical one), but one of considering them part of the adaptive environment for languages. And this is precisely the usual point of view of the FCP:

> Human children appear preadapted to guess the rules of syntax correctly, precisely because languages evolve so as to embody in their syntax the most frequently guessed patterns. The brain has co-evolved with respect to language, but languages have done the most of the adapting (Deacon 1997: 122).

[22] E&L themselves suggest that the model offered is intended to determine "how much design must be in the organism and how much design can evolve on purely cultural grounds" (E&L 2010: 2734) and they definitely opt for the second option.

For this externalist and adaptationist conception, in which languages evolve independently, the explanation for convergent evolution is not a matter of the restrictions of evolving systems themselves, but, as in the neo-Darwinian model of natural evolution, an explanation which relies on the evolutionary analogy favoured by the similarity of adaptive environments:

> Grammatical universals exist, but I want to suggest that their existence does not imply that they are prefigured in the brain like frozen evolutionary accidents (...) they have emerged spontaneously and independently in each evolving language, in response to universal biases in the selection processes affecting language transmission. *They are convergent features of language evolution in the same way that the dorsal fins of sharks, ichthyosaurs, and dolphins are independent convergent adaptations of aquatic species* (Deacon 1997: 115-116, my italics).[23]

It is illuminating to observe how Deacon (also Briscoe, and E&L) seem to take for granted that the resemblance between legs, wings, eyes and fins in the animal kingdom can be explained via pure analogy, that is, as a product of independent (convergent) evolution. However, this is not the only conceivable path. It would certainly be unwise to rule out effects of this type in language change, but the recent development of evolutionary theory clearly makes it inadvisable to ignore the role of formal and invariant principles in the explanation of linguistic convergences.

Although it is a deep homology and not (at least apparently) a consequence of "design laws of organic matter", the fact is that the evolution of the examples mentioned by Deacon and Briscoe (dorsal fins, wings and eyes) is one of the central arguments that can be used to oppose the adaptationist model of the new synthesis. Thus, as shown by Sampedro (2002: 119 et seq.), Gehring's group showed that the gene Pax-6 (eyeless in Drosophila) is the *same* regulatory gene that controls the tens or hundreds of genes that form both Arthropod and human eyes. This makes clear that while evolution and selection have modified many of these

[23] In a similar vein, Briscoe states: "such historical pathways can be stereotypical responses to similar pressures arising in unrelated languages, *in much the same way that eyes and wings have evolved independently in different lineages many times*, without the need to posit a substantive theory of such changes or to see them as deterministic" (Briscoe 2002: 13, my italics). Of course, E&L share this view: "the distribution of attested structural types across the design space reflects the likelihoods of the evolutionary pathways that would engender them, rather than specific constraints on the structures themselves" (Evans & Levinson 2010: 2734)

genes to produce eyes so incredibly different as the compound eye of crustaceans and our own human eye, there is in fact a deep homology here. And the same can be said in general terms of the other body parts mentioned: wings, legs and fins have all traditionally been used as examples of evolutionary analogy, of convergent evolution, as clear examples of how the medium shapes the adaptation of organisms, yet all have been revealed, so to speak, invented at a time in nature.

The conception of languages as external systems whose evolution is (more or less loosely) constrained by the human brain and human societies is valid as a metaphor, but it certainly can be detrimental to the naturalistic study of our language faculty. As noted by Kauffman "with the onset of full-blown evolutionism and Darwin's outlook on branching phylogenies, the very notion that biology might harbour ahistorical universal laws other than 'chance and necessity' has become simple nonsense" (Kauffman 1993: 5). The same error could occur in linguistic theory if the neo-Darwinian model of the FCP is accepted. As Kauffman also argues, "evolution, while destroying the idea of fixed species, simultaneously swept away the impetus to seek ahistorical laws of organic form" (Kauffman 1993: 3). But this very impetus, encouraged by the Chomskyan model, has gained ground in recent years, and its direction in this regard is akin to that of the bulk of biological science (see Narita and Fujita 2010, Benítez-Burraco and Longa 2010, Boeckx, this volume, Longa and Lorenzo, this volume).

If there is, as suggested by the minimalist model, a universal syntax (derived from type 1 or type 3 factors, or a mixture of both), such a syntax may function as a source of "order" in the "organisms" that would be independent of (in fact immune to) natural selection (i.e. language change). As suggested by the formal biological model proposed by Kauffman, part of the order that exists in the natural world exists "not because of selection, but *despite* it" (Kauffman 1993: 16, original italics).

7. Co-evolution: When Linguistic change and language evolution are conflated

When speaking of co-evolution there is a tendency to identify (in fact to mistake) the evolution of language as a human faculty with the evolution of languages as historical objects.[24] This is not surprising

[24] Hereinafter (and to avoid ambiguity) I employ the term *language evolution* to refer to the evolution of the language faculty in the human species over geologic

because, as we have seen, in the FCP the conception of the faculty of language is purely inductive, and thus the faculty of language in the species would evolve as a consequence of the individual evolution of languages. However, the confusion between linguistic change and language evolution has serious consequences for the scientific and naturalistic study of language and sends an inappropriate message to the cognitive sciences.

As we have seen, the mere formulation of a theory of co-evolution between language and the brain implies a dualistic conception according to which language is external to the brain (and not a property or a state of it). It also implies (which is even more striking) that language and the brain evolve independently, although with interactions. This, indeed, is the point of view defended by E&L (although they do not mention Deacon):

> Coevolving sociocultural systems (languages) and their biological platforms (human brains) spur each other on [...] Once a coevolutionary approach is adopted [...] the presence of any universal feature calls for explanation in terms of two interacting components: the evolving semiotic system, and the evolving capacities of its users (E&L 2010: 2746).

The dualist logic of the co-evolutionary model implies that languages function as adaptive environments for the brain, and that the brain functions as an adaptive environment for languages, since the model states that the brain evolves to learn (and use) languages, and that languages evolve in order to be learned (and used) by the brain.

It is difficult not to perceive this process as circular. Note that since brains are, clearly, prior to languages, then languages must have been produced by brains in first instance (or less plausibly, they were copied form another species). After this, languages would have been evolving (changing over time) and acquiring new emergent properties that, in turn, served as a new adaptive environment for brains themselves. Whence comes the structure of a language, other than that resulting from constraints imposed by the brain itself, remains a mystery.

Since the FCP tends to reject the notion that human beings have a natural inclination towards language, and prefers to think of general

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time (the issue discussed by Lorenzo, this volume), and the expression *language change* to refer to the change of languages in historical time, i.e. to processes such as those that led from Old English to current English or from Vulgar Latin to Spanish. This does not mean giving a qualitatively different value to the terms *evolution* and *change*.

learning and processing systems, it also favours a view according to which languages have done most of the adaptation in the co-evolutionary process while the brain has been limited to achieving a general state. As we have already seen, Deacon has noted that, "the brain has co-evolved with respect to language, but languages have done the most of the adapting" (1997: 22).[25]

However, apart from a problem of circularity, the theory of language-brain co-evolution has other potentially critical implications for cognitive science. If we assume some degree of co-evolution and we also assume the great depth of the diversity of languages (the central premise of the program presented by E&L), then we have no choice but to assume that different languages might have produced different types of brains, that is, different types of faculty of (or capacity for) language in the same species. Far from rejecting this conclusion, E&L seem to consider it seriously, even suggesting that the evolution of the "human capacity for language" is still changing:

> There are also fundamental differences in the way language is implemented in brains (...) reflected in considerable individual differences in language performance, providing the raw material for ongoing evolution. If we are at all interested in language diversity and language variation, or the instantiation of language in the brain, we will need to bear a coevolutionary model of language in mind (E&L 2010: 2742).

It seems to follow, then, that any differences in the localization of language in individuals or groups of individuals could be explained because those individuals evolved in different linguistic contexts. It is hard to imagine a more extreme relativism.

With their emphasis on the conception of language as a cultural tool ("processes of cultural evolution hone languages into the marvelous instruments they are", E&L 2010: 2742), E&L suggest that since "the anatomy of the hand has coevolved with tool using" (*ibid.*), human anatomy would have coevolved with languages. One might ask then why the use of different types of tools did not cause differences in the anatomy and physiology of the hand, which appears essentially uniform in the

[25] Note that otherwise it is not easy to distinguish this position from the traditional generative conception of UG as a *Language Acquisition Device*. Smith and Kirby (2008: 283) pose the dilemma clearly: "There are two possible sources of structure in language: biological evolution of the language faculty, or cultural evolution of language itself", and they make the second.

species. There are two options: either the structure of the hand is not the result of the co-evolution with manual tools (which seems the most reasonable), or the hand evolved when it used a single type of tool. In such a case we would have to assume that if there are not different capacities for language, it is because the FL evolved when there was only one language or a restricted type of languages. But in such a case, the evolution of the FL could not have been slow and gradual, as E&L (2010: 2742) stipulate.

Consequently, we can say that co-evolutionary theory predicts that humans should be grouped according to various capacities for language, just as they are superficially grouped by the colour of their skin, the shape of the eyes, or the size of the nose.

In fact, E&L consider this possibility:

> The interaction of genes and language continue to evolve, as shown by the recent finding that language change has been channeled by population genetics in the last few thousands of years (E&L 2010: 2742).

They cite as evidence for this "recent finding" the study of Dediu and Ladd (2007), according to which there is "preliminary evidence that gene pools with certain biases in allele distribution are more likely to harbour languages of specific sorts" (E&L 2009b: 480).[26] However, this study does not demonstrate that variation in certain genes has an influence on the development of tonal systems. Dediu and Ladd certainly suggest that these genetic differences might have an influence on language change, favouring tones:

> If differences in language and speech-related capacities are variable and heritable and if the genes involved have inter-population structure, it is likely that populations may differ subtly in some of these aspects, and that differences between populations could influence the way languages change through cultural evolution over time (Dediu & Ladd 2007: 3).

Their study, though, is based on a statistical correlation and nothing else (see Benítez-Burraco, this volume, for a thorough discussion on the criteria for the setting of correlations between genetic mutations and cognitive aspects). Mark Lieberman's commentary on this study suggests

[26] To which they add: "We are not dealing, then, with an invariant machine at all, but with a biological system whose evolution has relied on keeping variance in the gene pool" (E&L 2009b: 480).

that it presents merely that, a statistical correlation, and does not prove a causal relationship between genetic variants and the occurrence of tones in languages, which might have many possible explanations:

> I suspect (though I haven't shown) that by jiggering the parameters of the simulation, you could get a frequency-distribution of geographical correlations rather like the one the Dediu and Ladd found, without assuming any meaningful connection at all between genes and linguistic traits. And of course there really are some connections, if only because of linguistic endogamy.[27]

Even if we can bridge the theoretical (and empirical) problem of a diverse natural capacity for language in humans, a model in which linguistic structure and complexity is the result of the individual evolution of languages cannot avoid the prediction that some languages may be more developed and evolved than others. In other words, what underlies this kind of approach is (implicitly at least) a denial of the so-called *Languages Uniformity Hypothesis* (LUH). The LUH is a consequence of the belief that all human languages have the same degree of development or evolution, and that hence there are no primitive languages. This stance routinely appears in linguistics textbooks and is often presented as an achievement of modern linguistics. The typical ingredients of the formulation of the LUH are statements such as the following ones: There are no primitive languages; all languages have the same degree of complexity; all languages can perform the same function; all languages have the same dignity; all languages have at an abstract level the same

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[27] In http://itre.cis.upenn.edu/~myl/languagelog/archives/004554.html (accessed 09.20.2010). Dediu and Ladd do not contradict these conclusions and, in contrast, recognise the lack of correlation (for what is known today), and declare that "it's certainly true, as Mark says, that our geographical correlations would mean more if they had proceeded from some experimental demonstration of some sort of genetically linked, language-related, cognitive/behavioral/perceptual difference". In the context of our discussion, the motivation to publish their study is not without interest: "But given the widespread assumption (rooted in the Boasian tradition, but with a significant contemporary boost from Chomsky) that the human language faculty is absolutely uniform across the species, it's very unlikely that we would have been able to get funding to look for such a difference first. So we started by doing something we could do on our own without such support, namely testing the apparent correlation" (in http://itre.cis.upenn.edu/~myl/languagelog/archives/004564.html, accessed 09.20.2010).

structure; all languages have the same basic components; all languages offer the same degree of difficulty of acquisition as native languages.

Of course, some of these claims might be false and others true, and authors, especially those aligned to the FCP, might share some of them and not others. Hereafter I will refer to the LUH in a broad sense as the assumption that all current languages have the same degree of evolution, i.e. that there are no languages that represent an earlier or less developed state of human language.[28]

Although they are connected, it is important not to confuse the LUH, which is an empirical hypothesis, that is, a statement about the existence or non-existence of certain objects, with the so-called *uniformitarian principle*, which is a fundamental methodological principle of historical linguistics. In fact, uniformitarianism is a general principle of any historical science, whether linguistic, biological or physical.[29]

The LUH raises two critical issues: (i) if it is correct or not, and (ii) if correct, why.

In general, most linguists accept the broad version of the LUH, but it is the case that they do not agree what the ingredients of the formulation are; it is easy to imagine, for example, that E&L would not subscribe to all the points listed above. This makes addressing problem (i) especially fruitless, since previously we must specify clearly what is meant by "primitive language" or what is meant by "a language that represents a previous evolutionary state of the language faculty", which would lead us to define "language faculty", and so on.

We will therefore focus on problem (ii) in order to show that although almost all linguists formally endorse the broad version of the LUH, the hypothesis does not follow from all approaches to the question of language diversity.

If we ask any of the countless advocates of LUH why there are no primitive languages, two types of responses are likely, which I will call

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[28] A typical (and significant) example is that of Joseph Greenberg, who stated the following: "Certainly, then, the evolution of language as such has never been demonstrated, and the inherent equality of all languages must be maintained" (Greenberg 1957: 65).

[29] A particularly clear definition of that general principle is that of Roger Lass: "the principles governing the World (= the domain of inquiry) were the same in the past as they are now" (Lass 1997: 25). This general principle invites us to assume the maxim that nothing impossible today was, in principle, possible in the past, so we should rule out reconstruction proposals involving states or processes that are impossible today.

"homological" and "analogical" theories of language uniformity and which, not surprisingly, match the biolinguistic and the functional-cognitive paradigms respectively.

The homological theory of language uniformity would contest that all current languages are the result of a single language faculty, which is the consequence of natural evolution in the species; therefore, any natural language spoken by a human being is limited or conditioned by this faculty and cannot be primitive. Primitive languages disappeared with the disappearance of species that had primitive language faculties.[30]

The analogical theory, in contrast, would argue that there are no primitive languages because all current languages have been evolving for tens of thousands of years, constrained by human processing and acquisition systems and by the cognitive and communicative functions they must fulfil. During this time, either modern human languages caused the extinction of primitive languages, or the latter turned into the former. We can characterise this view as analogical in the sense that the explanation of the uniformity would be the long-term historical evolution of each language.

There is a crucial difference (not always marked) between these two approaches regarding the LUH: the relevance that is given to linguistic change in the process of language evolution. For homological theories, language change does not have functionally positive or negative effects, and is wholly independent of the phenomenon of language evolution, which concerns the biological evolution of species. However, for analogical theories, language change is typically sensitive to such external factors and, although not often explicitly recognized, it is not conceived of as independent of the phenomenon of language evolution.

In English, but not in other languages, the word *language* serves two functions: it represents particular languages (cf. French *langue* or Spanish *lengua*) and also language in general (cf. French *langage* or Spanish *lenguaje*). Thus, an expression such as *language evolution* can refer to both the historical changes in languages and the evolutionary process that created our special ability for language. However, this "unfortunate ambiguity" (Hurford 1992: 273) is not the only cause of frequent uncertainty regarding the use of expressions such as *language evolution* or

[30] The term *homological* is used metaphorically, in the sense that I do not mean that from this point of view structural uniformity of language is the result of common inheritance from a protolanguage, but rather that the source of such uniformity is the faculty of language as a biological attribute of every human being.

language development. For some authors, there is an authentic vagueness to the process of language evolution and the process of language change, which is of great importance in predicting the LUH. From this viewpoint, language evolves across the evolution of languages, which in turn are influenced by cultural evolution, whereas for 'homologists', languages do not evolve but simply change.

When we define a language as a historically modified mental organ, we are assuming that linguistic change is the main cause of linguistic diversity, a conclusion identical to Darwin's when he suggested that species' mutability explained the existence of different species. Therefore, the question regarding the extent of linguistic diversity is tantamount to the question of the transforming capacity of the change process. Can processes of linguistic change produce anything that is not a language? The answer seems clear: "no". On the other hand, can linguistic change produce a language from anything that is not a language? Again, the correct answer seems to be "no". This is the answer from a biolinguistic point of view, but it is not universally accepted. In fact, many authors think that linguistic changes were a central part of the evolution of language (e.g. Heine and Kuteva 2007 and references there).

Consider, for example, Comrie (2003):

> As a result of the recent development of grammaticalisation as a tool in historical linguistics it has been possible to develop a more general variant of internal reconstruction (…) that does enable us to come up with plausible hypotheses concerning earlier states of *language development* (Comrie 2003: 249, my italics).

What is Comrie referring to, linguistic change or language evolution? This short extract, which includes one reference to the method of internal reconstruction and another to the concept of grammaticalisation, may suggest that Comrie refers to linguistic change in historical time, but this is not the case. He really refers to both, simply because a purely historical conception of languages admits no precise way of differentiating between the two phenomena. This, in my opinion, weakens the LUH notably.

Later, in the same article, our suspicion is confirmed:

> We can take grammaticalisation and base on it a kind of generalised internal reconstruction that gives us access to hypotheses concerning earlier stages of the language in question and by generalising our conclusions to earlier stages of language in general (Comrie 2003: 249).

The reference to "earlier stages of language in general" only has meaning as an allusion to the development of the faculty of language in the species. However, note that we are then admitting that linguistic change is directional and capable of changing the faculty of language (if recognised as such at all). Insofar as languages change at different rates and in different directions, we must also admit that the faculty of language is not uniform across the species and that, in fact, this faculty continues evolving among different groups.

In the homological scenario there is a point in human evolution that produces a modern faculty of language. After this point all languages will be modern languages.

In the analogical scenario human biological evolution is, of course, a condition for language development; however, it does not specify the structural properties of languages, but only a new environment for the evolution of languages. Thus, once humans crossed this frontier of evolution, human languages began to develop, through linguistic evolution, the structural complexity that now characterises them.

The critical difference is that in this scenario the imaginary line that separates cognitively modern humans and their ancestors does not coincide in time with the imaginary line that separates primitive languages and modern languages. That is, the historical moment at which every historical lineage reaches, through the effect of linguistic change, the status of non-primitive language may be (must be?) different for each linguistic lineage. This scenario envisages the possibility that certain human languages, perhaps now extinct and unrecorded, did not successfully cross that frontier.

Notably, the LUH also follows from this scenario, but in a rather different way. Under this approach, it is conceivable that some languages, although spoken by anatomically modern humans, continue to be primitive languages. Actually, this analogical model predicts that it is highly probable that during long time spans, some anatomically modern human groups would speak primitive languages while others spoke modern languages.

According to this model, if there are no primitive languages today, it is because they have either become extinct or evolved historically towards modern status. In other words, in the analogical scenario, the LUH is contingent even though it remains a highly probable outcome.

Now it is easier to understand why Comrie (2003) asserts that current studies on grammaticalisation (which conceive of it as unidirectional) can offer insight into early states of human language, and why he proposes to

relativise the uniformitarian principle, excluding from it ancestral language states.

On this approach, the transition between modern and primitive languages is gradual and merely historical. Language evolution (beyond a general biological endowment) limits itself to the evolution of languages; therefore, the reconstruction of the past of languages is equivalent to the reconstruction of primitive language.

As we have seen, in Deacon's tradition, the ambiguity of expressions such as *language evolution* entails not only vagueness but also a deliberate mixture of the two meanings (this is precisely the meaning of 'co-evolution'). Recall that if we assume this model to be correct, we need also to assume that all languages have reached a sufficient level of complexity to affect their users' brains (that is, to function as adaptive factors for the brain). However, the model then predicts that it is possible that there exist human groups with pre-human cognitive abilities: those whose languages did not evolve in the proper way.[31]

The main difference between the analogical model and the homological one is that the former lacks the boundary provided in the latter by the assumption of a qualitative jump between classes of languages. The postulation of a biological evolutionary endowment that gives rise to a modern FL allows one to establish a historical discontinuity between the classes of languages generated by evolutionarily differentiated FLs. The absence of this boundary in the analogical model may cause the attribution of the LUH to the hypothesis that languages have converged into uniformity under the effects of the passing of time and external pressures. But note that in this case the LUH is not predicted (let us say it is a possibility, not a necessity) and henceforth we must entertain the possibility that this confluence has not occurred. In such a case, some languages could be primitive, that is, languages that because of diverse historical ups and downs failed to reach the aforementioned boundary. Everett (2005) proposes just this about the Amazonian language Pirahã, which according to him lacks one of the (supposedly) central traits of human languages: recursion. Everett claims that in this language, phrases cannot be embedded into other phrases (so that there are no subordinated clauses). Everett interprets this as a cultural constraint on grammar and presents it as an empirical argument against a naturally determined FL and in favour of relativism. Nevins *et al*. (2009) forcefully refute this analysis. In his reply, Everett (2007) admits that he does not mean that the Pirahãs'

[31] Nevertheless, I know of no one who has claimed this, not even Daniel Everett, the champion of modern relativism.

minds are limited in the use of recursion or the use of recursive languages, which orientates us here to the analogical model; what Everett is implying, then, is that some languages analogous to those of the previous stage of human evolution did not become extinct, but rather still exist today. This is a denial of the LUH.

It is true that the homological model smacks of circularity insofar as modern languages are defined as those spoken by modern humans. However, in the final analysis, this is the crucial matter: is the boundary between pre-language and language just cultural, or is it biological?

To answer that it is both things (as in co-evolution theories) amounts to saying that it is cultural insofar as if the historical process does not occur, then neither does the transition. If we make this claim, however, we assume that there exist modern human beings that nevertheless speak primitive languages, that is, classes of languages produced by ancestral language abilities that for contingent reasons (social or cultural) have not had sufficient time to evolve in the expected way.[32] I think that this is the only foundation on which the emerging new and radical relativism can be constructed, but it is a rather weak one. The empirical robustness of the LUH, then, can be seen as an argument in favour of the biological theory of the uniformity of languages.

8. Neo-relativism and human nature

It is not surprising that the centrality that the FCP confers on the diversity of languages and the sharp perception of its depth have meant a revival of linguistic relativism (e.g. Lucy 1992, Levinson 2003). In fact, as we have seen, the perception of how deeply different languages may influence cognitive processes of human beings is even increasing.

Questions such as to what extent the languages we speak determine how we see the world, how we think, and how we live our lives have always fascinated people and have been addressed by a multitude of philosophers, anthropologists, linguists, and with much more zeal recently by psychologists and psycholinguists. Precisely because of the close attention it has received from various fields, linguistic relativity is not easy to define. Instead of trying to do so, I shall characterise *linguistic neo-*

[32] Even Comrie, when he suggests distinguishing between "the human language potential" and the "realisation of the human language potential" (Comrie 2003: 250), is obliquely introducing an anti-unformitarian stance.

relativism by citing the prestigious experimental psychologist Lera Boroditsky:

> Linguistic processes are pervasive in most fundamental domains of thought, unconsciously shaping us from the nuts and bolts of cognition and perception to our loftiest abstract notions and major life decisions. Language is central to our experience of being human, and the languages we speak profoundly shape the way we think, the way we see the world, the way we live our lives (Boroditsky 2009: 129).

This strong relativistic statement has at least three implications, all of them problematic: (i) if language influences thought, then language is different from thought; (ii) languages influence the way we see the world, and it is not our way of seeing the world what influences languages; and (iii) there is empirical evidence confirming the first two statements.

As regards the first implication, note that the mere question about the relationship of determination that exists between language and thought necessarily implies previous definitions of *language* and of *thought*, but these definitions are not to be found in the works that have addressed this issue, both past and present; this is little surprise, since we simply lack of such definitions. Of course it is entirely possible that language does not only influence thought, but that language is part of thought. Even in such a case the relativist hypothesis is not necessarily correct, and is so only if language is identified with languages (i.e. in an inductive sense). Thus, from a point of view according to which the diversity among languages is relatively superficial (that is, confined to the manner in which homogeneous computational processes are materialised), the discovery that human thought makes extensive use of language does not in any way lead to the conclusion that human thought is fragmented into groups coinciding with languages. Quite the contrary, it would support the hypothesis that human thought is essentially homogeneous within the species. In fact, any theoretical model that accepts a certain degree of natural bias towards language acquisition should reject Boroditsky's reativist hypothesis[33]. Only a radically empiricist conception of the human

[33] As Bolender notes, "if some sort of Whorfian hypothesis turns out to be true, as these works suggest, this should not only mean that linguistic differences account for some cognitive differences. It should also mean that linguistic similarities account for some cognitive similarities across cultures. If linguistic differences so crucially enter into cognition, as a Whorfian would claim, it is unlikely that similarities would be cognitively irrelevant" (Bolender 2010: 2662).

mind and brain could accept that external cultural objects (human languages in the FCP) could "profoundly shape the way we think".

One can infer that Boroditsky (2009) and Deutscher (2010), to cite only recent work of great social impact, accept that languages influence thought because they operate with a rather vague notion of thought (and, obviously, because they believe in the myth of the diversity of languages). In a review of Deutscher (2010), published in *The New York Times* (September 5, 2010), Derek Bickerton notes that the aspects of language Deutscher deals with "do not involve 'fundamental aspects of our thought', as he claims, but relatively minor ones". Thus, Bickerton points that issues such as location, colour or grammatical gender (which are also the main topics dealt with experimentally by Boroditsky to give support to her proposal) probably have little conditioning on our thought in the daily management of our lives, and far less still when developing political, scientific or philosophical thought.[34]

Let us address the second and third implications of the relativist hypothesis: that languages determine our way of seeing the world (and not vice versa), and that we have empirical evidence for this. In fact, Boroditsky argues that, compared to discussions about the relationship between language and thought in the past, empirical work is currently being developed that could solve these ancient disputes. Specifically, she states that research conducted in her laboratories at Stanford and MIT has produced a large collection of data from around the world (China, Greece, Chile, Indonesia, Russia and Aboriginal Australia), and she concludes that

> what we have learned is that people who speak different languages do indeed think very differently and that even flukes of grammar can profoundly affect how we see the world (Boroditsky 2009: 118).

This is not the place for a detailed review of the ingenious experiments and remarkable discoveries in this field of research, but it may be sufficient to consider, for example, what kind of experimental evidence supports the claim that "flukes of grammar can profoundly affect how we see the world".

Boroditsky (2009: 127) asks whether the fact that in Russian grammar *chair* is masculine and *bed* is feminine makes Russian speakers think that in some way chairs are more like men and beds are more like women. Her

[34] Thus, Bickerton concludes in the aforementioned review: "Moreover, with the possible exception of color terms, cultural factors seldom correlate with linguistic phenomena, and even when they seem to, the correlation is not causal".

conclusion is that it does. To provide empirical support for this assertion, Boroditsky and colleagues (Boroditsky *et al*. 2003) asked speakers of Spanish and German to describe in English opposite gender objects in these two languages (for example *key*, which is feminine in Spanish, *la llave*, and masculine in German, *der Schlüssel*). Thus, Spanish speakers were more likely to use words like *golden*, *intricate*, *small*, *beautiful*, *bright* or *very small*, while the Germans tended to use more words like *hard*, *heavy*, *irregular*, *jagged* or *useful*.[35]

Regardless of the details of the experiment and of the criteria for determining which terms are more characteristic of men or women in certain societies, it does not seem that these results show that the language we speak "profoundly" determine our world view, but only that speakers of languages with masculine and feminine gender marking may be prone to extend sexual stereotypes to sexless objects, an extension based on the analogy of grammatical gender that is not available for English or Japanese speakers. We simply cannot infer from these experiments that a Spanish speaker conceives of the bridges in a "profoundly" different manner than a speaker of German (or English). There does not appear, at least, to be systematic differences in how bridges (or keys) are built and designed in Germany or in Spain; in such tasks aspects of physics, engineering, strength of materials, economics and (of course) aesthetics come into play, and these do not seem to be grouped linguistically.

Of course, it is clear that languages interact with culture and that, to a large extent, are part of it. Another example discussed by Boroditsky and colleagues is the expression of space in languages, a topic addressed in depth by Levinson (2003). According to Boroditsky, Thaayore Kuuk speakers (Pormpuraaw, Australia) do not express space in reference to an observer (left, right, front, back), but use the cardinal points (north, south, east, west). It seems to be the case that having to speak a language in which instead of saying "my left leg" it must be said "my west leg" makes it essential that one always knows where west is. According to Boroditsky,

> the result is a profound difference in navigational ability and spatial knowledge between speakers of languages that rely primarily on absolute references (like Kuuk Thaayorre) and languages that rely on relative reference frames (like English) (Boroditsky 2009: 121).

[35] Another example used by the authors is *puente* ('bridge', masculine in standard Spanish) compared to *Brücke* (feminine in German), with similar results. Interestingly, *puente* is a variable gender word in Spanish, being feminine in some dialects.

She goes on to claim that

> speakers of languages like Kuuk Thaayorre are much better than English speakers at staying oriented and keeping track of where they are, even in unfamiliar landscapes or inside unfamiliar buildings. What enables them—in fact, forces them to do this—is their language (ibid.)

But if the *cause* is the language istelf, one might wonder what is the cause of a situation where in some languages people use "left", "right", "ahead" or "behind" and in others they use "east", "west", "north" or "south". It seems clear that the answer cannot be other than that the speakers of the second group pay much more attention to the cardinal points. The argument, then, is circular.

At some point, certain aspects of the culture or lifestyle of people led to those decisions, so it is unclear how one might conclude that it is the language which influences the world view, and not the world view which influences the language. All languages, especially in their lexicon, have a dimension which is sensitive to people's culture and lifestyle and, in effect, transmit culture and a view of life. A community that loves mushrooms is likely to have terms for many varieties of mushrooms, a richer lexicon in this respect than a language spoken by those living in deserts. But it would be unwise to say that having many words for different varieties of mushrooms causes a greater appreciation for such a food.

To put it in clearer terms: when Deutscher and Boroditsky (following numerous authors) argue that languages determine or constrain our vision of the world, what they are really saying is that those parts of languages sensitive to culture determine or constrain our culture, something that can not be disputed.[36]

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[36] Boroditsky (2009: 124) asks "how we do know that it is language itself that creates these differences in thought and not some other aspect of their respective cultures?" (2009: 124). Her answer is based on experiments in which English speakers are trained to express time, for example, as Greek speakers do, and once they are trained, they show that "their cognitive performance began to resemble that of Greek [...] speakers" (2009: 124-5), which, according to Boroditsky, "suggest[s] that patterns in a language can indeed play a causal role in constructing how we think" (ibid.). But note that assuming these individuals have changed their way of thinking implies a very vague and imprecise definition of "thinking". Likewise it could be argued that when the subjects are trained they acquire a new "culture" that affects their performance. Boroditsky adds that "in practical terms, it means that when you're learning a new language, you're not simply learning a new

Undoubtedly, good orientation in space is part of the culture or the lifestyle of the Kuuk Thaayorre. It is also clear that their culture has made their language (like those of other aboriginal Australians) express in this way both spatial location and, by analogy, temporal location. Indeed, this is shown in experiments that Boroditsky (2009) reviews in which speakers of this language were asked to order some drawings temporarily, and instead of doing from left to right, they did it from east to west. But what the experiment really shows is not that language determines thought, but that Kuuk Thaayorre speakers are sensitive to their culture both when speaking and when performing certain experimental tasks.

Boroditsky formulates the key question as follows: "are languages merely tools for expressing our thoughts, or do they actually shape our thoughts?" (Boroditsky 2009: 118). Note, however, that the alternative offered is too narrow and blocks a lot of options that are discarded without consideration. In fact, as we have seen, we have every reason to believe that languages are not tools to express thoughts or shape our thoughts. There is the option that languages are different materialisations, variable and historically conditioned, of a single system of knowledge. Certainly, it would be surprising that a computational system that allows us to create new expressions without theoretical limit, without scope restriction and free of conditioning stimulus (and which is at the heart of every human language), were not also involved in the way humans think about the world and try to understand it in a specifically human way, beyond evident (and interesting) cultural differences.

I have argued above that psycholinguistic experiments designed to demonstrate the influence of languages on thought actually reveal that culture can affect languages. This is no doubt the case, and languages are important vehicles in the transmission of culture from one generation to another.

It could then be argued, however, that another path to linguistic relativism is opened up. Indeed, if we apply the analogy with natural evolution, one would expect that languages somehow adapt to the worldview of their speakers, in the same way that organisms adapt to their environment. That is, we might expect some type of correlation between the structure of languages and the cultural environment in which they are spoken, which in turn would help validate the relativist hypothesis.

It is true that, although in a blind and random manner, natural organisms adapt to the environment. Think of a hippo or a whale. It is

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way of talking, you are also inadvertently learning a new way of thinking" (2009: 125), which in this context is the same as saying you are learning a new culture.

clear that they are adapted to live in the water, but only when compared with a cow or an antelope and not, for example, with a tench or a bluefin. The environment clearly influences the selection of variants, but it is difficult to delimit the extent of this. Speaking of culture, ideology or worldviews as adaptive frameworks of languages is too loose and general.[37]

It is therefore likely that the effect of culture on languages is very limited, although superficially very visible. In the biolinguistic model reflected in this chapter, the effect of culture (understood as the way of life, traditions and social, political and religious institutions of a human community) is limited to only those domains of language that are not driven by naturally conditioned principles (be them 1 or 3 type factors), mainly in the sphere of lexicon and, of course, phraseology.

As regards the deepest aspects of the structure of languages, if they adapt to the environment, then we can conclude that the environment is nearly invariable. This would not be surprising if such an environment were mainly internal to the brain and mind. As pointed out by Pinker, there are languages in which the direct object follows the verb and languages in which it precedes the verb, but there are no left-object cultures and right-object cultures.[38]

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[37] Even in the natural world the environment may be rather complex. If we think of a whale, water comes to mind, but if we think of a peacock, we find that its physical environment is not very useful in explaining its hyperthrophic tail unless we include peahens' mating preferences as part of their "physical environment". Peacocks' wonderful tails do not help them to nimbly escape predators or go unnoticed, but it seems that peahens select this kind of tail, perhaps simply because they like it. Delimiting the environment for natural selection is not as easy as it seems, and the exercise is exponentially harder for "linguistic selection". The quantity of different factors that can affect the destiny of a linguistic variant is so complex and varied that the concept of adaptation to the environment ("culture") is simply not concrete.

[38] "One of the great findings of linguistics, vastly underappreciated by the rest of the intellectual world (and probably not highlighted enough by linguists themselves) is that the non-universal, learned, variable aspects of language don't fit into any meaningful, purposive narrative about the surrounding culture. Linguists have documented vast amounts of variation, and have a good handle on many of its causes, but the causes are internal to language (such as phonological assimilation and enhancement, semantic drift, and syntactic reanalysis) and aren't part of any symbolic or teleological plan of the culture" (Steven Pinker, in http://www.edge.org/discourse/recursion.html).

In the review of Deutscher (2009) mentioned above, Bickerton offers an exaggerated (almost cartoonish) hypothetical correlation that, unlike the expression of space or morphological gender, would be relevant to the relativist hypothesis:

> Suppose relative clauses appeared only when a society entered the market economy. Any such finding would revolutionize our understanding of the interface between language and culture. But not only has no such relationship ever been demonstrated, nothing remotely like it has ever been found (Bickerton, *loc cit*.)

I share this observation, but one may wonder if Bickerton has ever read Everett (2005).

9. Conclusion: The true value of linguistic diversity for Biolinguistics

I suggested at the beginning of this contribution that from a biolinguistic point of view the relationship between language and languages is comparable to the relationship between life and living organisms. For this reason I think E&L are right to compare the importance of species diversity as a way of understanding life with the importance of language diversity as a way of understanding language:

> In all these fields, variation is the lever used to discover underlying systematics: you can't find a gene without phenotypic variation, and you can't find a fundamental building block for language without comparing languages (E&L 2010: 2735).

However, a different conception of what languages are (and even of what natural science is) has led us to very different conclusions. I have here criticised E&L's proposal of seeing the diversity of languages as the essential feature of human language from the biological standpoint. But this does not mean that the diversity of languages should not be analysed, explained and used as a relevant factor at the heart of cognitive science.

We have seen that from a biolinguistic point of view languages are historically modified natural objects, just as living organisms are. We have also seen that from the standpoint of evolutionary theory, there are different ways of understanding what the organisms themselves are. As George C. Williams has put it, "mechanistic biologists assume an *organism-as-crystal* and adaptationists an *organism-as-artifact* concept" (1992: 6). The first view focuses on discovering, through variation, the

general principles that influence and determine the structure of living beings, while the second focuses on explaining variation as a result of adaptation through natural selection.

If applied to the study of language variation, the two views produce conflicting and to a certain point irreconcilable approaches (the deductive and the inductive ones). However, Williams adds a third perspective: "An *organism-as-document* approach should also be recognized for biologists interested mainly in unique evolutionary histories" (Williams 1992: 6). In my opinion, this is the right perspective to understand the diversity of languages and convert it into a source of privileged information to understand the human faculty of language.

The FL is an attribute of the human species to the same extent as, for example, the capacity of vision or memory. But there is an important difference: a person's capability to see, with its inevitable peculiarities, is essentially the same for all people, whether socially proximate and distant. However, the FL of a person who speaks Spanish is different from that of a person who speaks Russian, although both languages are manifestations of the same natural faculty. From this point of view, the most important information that linguistic diversity gives us about the FL is precisely that the language organ of humans, while a mental organ like any other, is peculiar in a crucial sense: it is a mental organ that is influenced to a comparatively deep degree by culture and history. Thus, although vision, memory or the capacity of facial recognition are mental organs such as language (and they are all the result of the interaction between nature and environment), the structure and properties of the FL of each person not only depend on natural conditioning, but also on historical aspects that do not seem relevant to other mental or physical organs.

As noted by Longobardi (2003: 102), memory and vision appear to lack a relevant cultural history and, unlike language, do not allow a comparative study as in the case of languages.[39] The true value of the diversity of languages for cognitive science is that it provides what is

[39] "These cognitive systems are also subject to variation, but the variation is less rich, essentially individual rather than dependent on cultural transmission: it is not acquired from an environmental stimulus produced by similar cognitive structures ('other minds') and therefore modelled after the latter. Therefore, it does not obviously present the aggregation of properties changing with each other and correlating with external variables (e.g. space/time coordinates) which characterizes languages. In short, it hardly makes sense to talk about modern Spanish memory or medieval Russian vision" (Longobardi and Roberts 2010: 2702)

probably a unique opportunity in the field of cognitive science for addressing the same faculty from various historical solutions (documents) restricted by the same principles.

The deductive or parametric approach to the structural diversity of languages has resulted in work that is clearly beneficial to the future of cognitive science. On the one hand, in the wake of the linguistic typology of the second half of the twentieth century, this approach has led to the accumulation of a wealth of information about delimited regions of the grammar of languages, allowing a greater understanding of the many variables that can affect cross-linguistic comparison. On the other hand, the minimalist conception of UG has made possible a further refinement in approaches to the structural diversity of languages, leading to the hypothesis that structural variation is limited to the materialisation or externalisation of syntactic computations in morphological systems sensitive to environmental information and, hence, historical products themselves. As Longobardi and Roberts note, "this suggests that parametric analysis reflects actual processes of cognitive history, explaining the present distribution of syntactic properties on the grounds of their past" (2010: 2702).

The diversity of species is simply the result of change, and the same is true of the diversity of languages. Whenever a human being constructs from environmental data the interfaces between the computational system and the IC and SM systems, he/she is adding to his/her FL a historical record of how these interfaces were made in previous generations. In the discovery of regularities and systematic clusters of these processes, historical and comparative linguistics has a significant contribution to make to the investigation of the ultimate nature of the principles that characterise the human faculty of language.

In this regard, the following words from Rizzi may well serve as a conclusion to this chapter on the myth of the diversity of languages:

> The cognitive sciences should not overlook the results of half a century of linguistic research which has seriously attempted to identify the limits of variation: it is simply not true that languages can vary indefinitely (Rizzi 2009: 486).