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NATURAL CONSTRAINTS ON LANGUAGE

Nature and Consequences*

Abstract: The article deals, from the point of view of linguistics, with the issue of why human language is made as it is. It gives methodological and epistemological reasons in favor of the hypothesis that language is a transactional device mainly conditioned by pragmatic needs, discarding the hypothesis that language is a computational system mainly conditioned by abstract rules, along with the associated view of the language faculty as an innate, specific (*i.e.* grammatical) device of the brain.

The authors claim that language is the result of the interaction of a highly complex set of “natural” constraints whose very origins are (i) in the structure of the world, (ii) the human body, (iii) in communication situations, (iv) in the need for representation of reality and events, (v) in the ergonomics of any system devoted to the functions of meaning and referring, (vi) in the structure and potentialities of the brain itself, conceived (crucially) as a set of general-purpose abilities. Constraints (i-iii) are analyzed in some detail, while (iv-vi) will be the topic of a subsequent article.

Keywords: brain, language, language design features, linguistic materialism, pragmatic foundations of language.

1. *What's special about language?*

Although reflection on language is used to concentrate on foundations only fitfully, a foundational motif appears as pivotal from time to time: it is the question of the “design features” of language (from now on, DF)¹, namely the issue about

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¹ At the outset of this debate there is Hockett’s seminal paper (Hockett 1963; also Hockett 1960, 1969), that apparently introduced the term “design features” and raised the question. The issue has

which properties a symbolic artifact *must* have in order to be a “language” – rather than, say, a mere list of words, a programming language, or a telephone directory.

A well-known title summarizes this topic quite expressively: “The faculty of language: what’s special about it?” (Pinker & Jackendoff 2005). What is “special” may regard the general form of language as a code, its internal structure, the way it links with the world, the tools and resources it can rely on, and so on. According to a very respected answer to that question (formulated by Chomsky, cf. Hauser *et al.* 2002), what really sets language apart from other communication systems is its having “recursion” as one of its tools. This assumption got scattered in various areas of the generative movement and elsewhere until it virtually turned into a postulate.

In this paper we intend to put forward another answer about what is special in language. Since the DF we shall propose are associated to the “material” and “natural” bases of language and since we consider them as the effect of limitations imposed by nature, we shall call them “natural constraints” throughout².

The paper is structured as follows: Section 2 discusses two opposed ways of viewing language and linguistics, one of which is subsequently picked up as the underpinning of our main argument; Section 3 analytically presents some constraints on language and proposes a classification of them; Section 4 proposes general conclusions on the future paths of language inquiry.

2. *An epistemological alternative*

2.1. Arbitrariness and immateriality

The use of the term “natural” transparently entails a polemic reference to the notion of “arbitrariness” since what is assumed to be “natural” is *ipso facto* intended as non arbitrary but imposed by something external. To put it otherwise, claiming that “naturalness” (or “naturalness”) has a role in the shaping of language entails restricting the domain of arbitrariness in a serious way.

For such reasons, before entering into our argument it may be useful to mention Ferdinand de Saussure’s tenets³ about the arbitrariness vs. naturalness opposition,

revived later with a certain continuity (see, among others, Chomsky 1979; De Mauro 1982; Simone 2007b: chap. 2; Hauser *et al.* 2002; Chomsky 2005; Pinker & Jackendoff 2005; Lazard 2006).

² This task can be regarded as ideally prolonging an aspect of the wide picture of alleged linguistic universals and language diversity proposed by Evans and Levinson (2009, § 4); namely, the idea that features widely shared by languages can be explained either (somewhat circularly) as necessarily belonging to the notion of a language as such, or as driven by “the multi-constraint engineering problems languages face” because of their being put at work in reality.

³ Or, rather, the ones usually attributed to him. As is known, Saussure’s *Cours* was not written in his own hand but it was gathered up by his best pupils with the aid of their own class notes. Whichever

which have a direct repercussion on the discussion on DF. They include the following: (a) language is “form” and not “substance” (Saussure 1916: 169), (b) it has a purely differential character as its units differ from each other independently, and irrespective, of their material nature (Saussure 1916: 163, 166), (c) it is arbitrary in relationship to any other external variable (context, the *signifiant* – *signifié* relationship, events and participants, pragmatics etc.) (Saussure 1916: 106-107)⁴. As a consequence, language is *totally* arbitrary, although containing limited “motivated” phenomena (Saussure 1916: 181 ff.).

A metaphorical illustration Saussure frequently used in order to make his point clearer offers an expressive illustration of this view: checks – he argues – may be played with pieces of *any* form and material, provided that the various sorts of pieces remain distinct from each other and that their respective movements are preserved (Saussure 1916: 153-154). The “physical nature” of the pieces involved (their stuff, shape, weight, etc.) is irrelevant to the deployment of the game. Analogously, the “material” nature of language (sound, breathing, the order of units in the chain, the length of units, intonation, etc.) is supposed to be insignificant to its functioning: what really matters is the differential nature of its units and the peculiar rules that govern them⁵. This is the main contention of the so called “radical arbitrariness” which Saussure is usually associated to. Moreover, the Saussurean *vulgata* dropped out the possibility of viewing any relationship between utterances and the extra-linguistic world: what utterances refer to has no link with them at all⁶.

Now, it is unquestionable that the Saussurean views did contribute to give the modern view of language a notable part of its current shape. In particular, such an attitude defined a sort of “de-materializing” approach to language. The impact of Saussurean thought on the main stages of Classical Structuralism (especially Glossematics and European Structuralism as a whole) strongly contributed to spread this view. Hjelmslev’s position, for instance (as in Hjelmslev 1943), largely

is the “genuine” interpretation of his texts, however, what matters is how they were taken on by subsequent linguistics and which general assumptions on language they contributed to disseminate.

⁴ The Saussure edition with De Mauro’s (1967) commentary authoritatively champions such an interpretation.

⁵ The “indifference to stuff” claimed by Saussure was criticized as early as in the ’40, however. Malmberg (1945) noticed for instance that no “shouted” language is known all over the world, even though humans can shout, since it could be neither supported by human articulatory organs nor tolerated by human ear.

⁶ We will argue later that, if language has to be explained in its relationship to the whole of reality (where it is used), it is not sufficient to say that the “Faculty of Language in the narrow sense [FLN] may approximate a kind of ‘optimal solution’ to the problem of linking the sensory-motor and conceptual-intentional systems” (Hauser *et al.* 2002: 1574), if the Faculty of Language in the narrow sense is equated to (almost only) recursion.

inspired to the “formal” and “differential” view advocated by Saussure, gave a further contribution to the dissolution of the material side of language. Generative linguistics itself is not immune from it at all. In spite of explicit efforts to keep their distance from a Saussure-biased position, generative ideas concerning the foundations of language are essentially in the same vein: since language is a computational system (a function of the mind), any material, physical, contextual determinism on it, whichever its source, has to be discarded in principle. (We shall discuss this point more in detail below.)

2.2. Two views of language

In today’s practice of linguistics virtually everyone has to make (even without realizing it) a choice among two options more or less accurately described as “formal” and “functional”.

This “controversy” has been described so many times (e.g., Newmeyer 1998; Darnell et al. 1999; Stetter 2001) that it would be pointless to resume it once more, was it not because it still shows traces of a “fossil radiation” of the “dematerializing” approach just discussed. It is this approach, indeed, which inspires the distinction among the “formal” and the “functional” option.

Not coincident with, but related to, this distinction, there is another major divide, currently active in linguistics, which concerns the way human nature determines the nature of language. Let’s then say some words about it, in connection with what will be our argument in this paper.

2.3. Language as a brain module

This approach views language in terms of a computational system whose structure and working substantively depend on the structure and working of the “machine” (intended as the “user’s mind”) it runs on. This machine is made of dedicated linguistic (more properly “grammatical”) modules in the brain, whose development goes back to a relatively recent stage of evolution⁷. The core language properties allegedly derive from a specific innate “language faculty” and are

⁷ “The simplest account of the ‘Great Leap Forward’ in the evolution of humans would be that the brain was rewired, perhaps by some mutation, to provide the operation Merge, at once laying a core part of the basis for what is found at that dramatic ‘moment’ of human evolution [...]. There are speculations about the evolution of language that postulate a far more complex process: first some mutation that permits two-unit expressions (yielding selectional advantage in overcoming memory restrictions on lexical explosion), then mutations permitting larger expressions, and finally the Great Leap that yields Merge. Perhaps the earlier steps really took place, but a more parsimonious speculation is that they did not, and the Great Leap was effectively instantaneous, in a single individual, who was instantly endowed with intellectual capacities far superior to those of others, transmitted to offspring and coming to predominate [...]” (Chomsky 2005: 11-12).

largely indifferent to the physical machinery of its users (this property is called “modality-independence” in Chomsky 2005)⁸.

In this framework some influence of “nature” on language *is* allotted, but it is not crucial to the constitution of language at all, because “nature” neither takes any peculiar part in the building of it nor affects this process by imposing constraints on it. More specifically, according to this hypothesis the human mind is endowed with a set of “switchers” that, for a given set of admissible parameters, decide what position each parameter exactly takes⁹. Finally, and more importantly, since language responds to a set of specifiable rules (i.e., to a grammar), anything apparently not responding to any such rule tends to be confined in an “external” space (generative linguistics calls it “E-language”) as opposed to the rule-governed section (“I-language”). Only the latter properly falls within the realm of linguistics¹⁰. To put it otherwise, and obviously summarizing, what we are used to calling “language” is composed of two sections: a truly computational (I-language) and a marginal one (E-language) which doesn’t comply with well-defined rules. Whereas the former is of interest to linguistics and cognitive sciences, the latter, being the realm of variation and irregularity, remains outside.

Such a dichotomy produces several consequences. First of all, a non-specifiable but significant part of language facts is left outside scrutiny. Furthermore, language, conceived of as a merely computational system, loses its rationale and practical import: it seems to have no symbolic function, meaning (i.e., reference and predication) is not vital to it, no community of users is concretely envisaged, it does not serve any social activity, its structures are not affected by use in space and time. In sum, it has very little to do with the world, language users, their intentions and goals, and so on. It is an *in se*, self-contained, “autonomous” system rather than a tool for human communities to solve their problems in the world¹¹.

⁸ A huge bibliography has been produced about this concept: see for instance Chomsky (1980, 1995) and the pretty conventional account in Pinker (1994).

⁹ This is typical of the Principles and Parameters stage of Generative Grammar (about which cf. Cook & Newson 1996, and Chomsky 2005: 8-10, more closely concerned with our issue).

¹⁰ For one of the strongest expositions of this point of view, cfr. what Jackendoff (1996) proposes as “the Mentalist Stance”, according to which important properties of human language “can be effectively studied without taking account of social factors.”

¹¹ Interestingly, Deacon (2003) describes the computational conception of language as “the most serious source of confusion about the nature of language universals”. Insightful remarks on this limitation are also in Fauconnier (1994: xxix).

2.4. Language as a transactional device

According to functional¹² approaches, on the other hand, language is a “transactional”¹³ device inasmuch as language and language-user affect each other in various senses and ways. Language organization and patterns are designed and remodeled all the time to permit interactions between users; correspondingly language patterns are affected by the use they undergo. The nature and articulation of such interactions crucially determine language structure up to a fine-grain level. Furthermore, if language is a symbolic system, it has somehow to do with the entities it symbolizes, and this relationship can be specified appropriately¹⁴.

In such a framework we assume that language is *intrinsically determined* by its material basis, thereby meaning that its structure and functioning is affected, to a specifiable extent, by (a) the physical constitution of its users, and in particular (b) their bio-psychological equipment, (c) the material stuff it is made of, and (d) the extra-linguistic context where it operates. To put it otherwise, it is made to convey at the same time predications, pragmatic effects, and information on the ongoing interaction.

Accordingly, there is properly nothing as an “E-language” and the very distinction between two language sections mentioned above is unnecessary and *ad hoc*¹⁵. On the contrary, everything in language is “true language” and has to be explained through general principles. What may appear fragmentary, marginal, occasional and non-responding to specifiable rules may be explained for instance as the effect of a variety of forces and drives to be traced to other repertoires than the computational (sometimes, allegedly “formal”) arsenal: economy, analogy, frequency, accumulation, efficiency, adaptation, and even mere historic hazard.

2.4.1. Particularly, on recursion

As already mentioned, in this framework recursion is considered as the main, if not the only crucial, distinctive property of language. Actually, choosing this property as characterizing human language is immediately linked to the “de-materializ-

¹² We use this term just for convenience. We consider it as reductive and inaccurate, since the “functional approach” does not limit itself to underline the “functional” character of language, but more in general emphasizes its pragmatic orientation.

¹³ The term “transactional” is from Dewey & Bentley (1949), who stressed that the object of knowledge (the “known”) is not indifferent to, but is affected by, the very subject who is knowing it (the “knowing”).

¹⁴ To say it otherwise, semiotics (rather than, for instance, psychology or computer science) is the meta-theory for linguistics (see Dressler 1990; Bronckart 2003). Some semiotic aspects of language are discussed below.

¹⁵ Elsewhere (as in Hauser *et al.* 2002), the I-language vs. E-language distinction turns into that between a FLN (Faculty of Language – Narrow) and a FLB (Faculty of Language – Broad).

ing” bias we described above¹⁶. We argue, however, that this is not a good choice at all.

First of all, recursion is neither solely operative in human language nor unique to it whatsoever¹⁷. Indeed, being originally a mathematical notion referring to an algorithm crucial to manage infinite sets, its application to language is acceptable just by preliminarily assuming that utterances in any language *are* mathematically infinite – which is far from being taken for granted, in spite of the age-old commitment of many (for a discussion, Parkinson 1970-1972)¹⁸. Moreover, whereas recursion may reasonably¹⁹ be postulated on one (or some) level(s) of language, like syntax (possibly also phonology), other levels seem to remain totally or largely unaffected by it. Is there anything as recursion in action in semantics or in morphology? This would be very hard to claim. Therefore recursion is neither necessary nor sufficiently diagnostic as the hallmark of human language as such.

There is more, however. What recursion entails from our specific point of view is its indifference to the operating system which it works with: it may run equally well in algebra, geometry, syntax, music, and so on, totally irrespective of the nature of the game being played. In other terms, recursion is a powerful general-purpose device rather than a discriminating DF for human language.

Moreover, since it is operational (if anywhere) in syntax, emphasizing it is tantamount to claim that syntax is the pivot component of language, which is far from being obvious²⁰. Finally, claiming its unique importance also implies to neglect that human language is not generically a “system”, but specifically a *symbolic* and *pragmatic* system, i.e., one whose utterances speak of something which, although different from them, has specific relations to them, and which aims at goals which may not be immediately in view.

¹⁶ “*At a minimum*, FLN includes the capacity of recursion” (Hauser *et al.* 2002: 1571; italics ours). We are not told what it may contain *at its most*, however. A strong defense of the “recursion-only” interpretation of language is in Pinker & Jackendoff (2005).

¹⁷ Hauser *et al.* (2002: 1574) recognize this when they propose that there may be “a much stronger continuity between animals and humans with respect to speech than previously believed” and advance the following, most intriguing, possibility: “discrete infinity” and (ib.: 1578) “recursion in animals represent<s> a modular system designed for a particular function (e.g., navigation) and impenetrable with respect to other systems. During evolution, the modular and highly domain-specific system of recursion may have become penetrable and domain-general. This opened the way for humans, perhaps uniquely, to apply the power of recursion to other problems”, including language.

¹⁸ This is a good example of what Fauconnier (1994: xxxiii) calls “Math envy”, which “spreads easily to other domains of inquiry that will ‘look’ (and feel) scientific by virtue of employing a ‘mathematical’ apparatus”.

¹⁹ “Reasonably” means here “not in strictly mathematical terms” but just in a – as it were – home-like, almost figurative sense.

²⁰ In this direction, cf. Evans & Levinson (2009: § 6).

As a consequence of stressing recursion as the main marker of human language linguistics may lose sight of a huge variety of concrete, empirical facets that could be more fruitfully produced as specific to language and apt to characterize it²¹.

Other, richer DF are needed, then, to circumscribe the specificity of language.

2.5. Remarks on language and brain

Selecting either approach in explaining specific language phenomena may look as a sort of pre-theoretical, even metaphysical, stance since at the current stage of research no strictly cogent demonstration is available to justify the choice of either (Lazard 2006). Still, we argue that the difference between the two alternatives may be viewed in terms of their respective epistemological fruitfulness.

On the one side, the knowledge we have so far of the working of the brain is quantitative rather than qualitative, being based on imaging techniques as PET and fMRI as well as on the measurements of event related potentials (ERPs) in the brain, such as (E)LAN, MMN or P600, and the like²². More specifically, what we know is that the brain activates (at best: in certain precise areas) when performing certain tasks. We partially know the nature of such an activation in terms of increased biochemical activity; but we completely ignore what the relation may be between physical activity and its subjectively perceived counterparts, viz. thought, language, conscience and so on. There is no cue to understand how something absolutely immaterial as consciousness can arise from something material as biochemical activity²³. According to Libet's (2005: §5.1.2.) survey of the state of the art:

It is increasingly evident that many functions of cerebral cortex are localized. This is not merely true of the primary sensory areas for each sensory modality, of the motor areas that command movement, and of the speech and language areas – all of which have been known for some time. [...] Localized function appears to extend even to the microscopic level within any given area. The cerebral cortex appears to be organized into functional and anatomical vertical columns of cells, each a millimetre or so in width [...]

The same author also underlines (§5.1.1.-5.7.) that:

²¹ Equally misleading is, in our opinion, to link the DF issue to the problem of the origins of language, but we cannot discuss this point here.

²² Plenty of confirmations may be found in the best literature on the issue. Cf. for instance Moro *et al.* (2001), Moro (2006), Friederici, Steinhauer & Pfeifer (2002), Friederici & Weissenborn (2007), Friederici, Schlesewsky & Fiebach (to appear), Crinion *et al.* (2006).

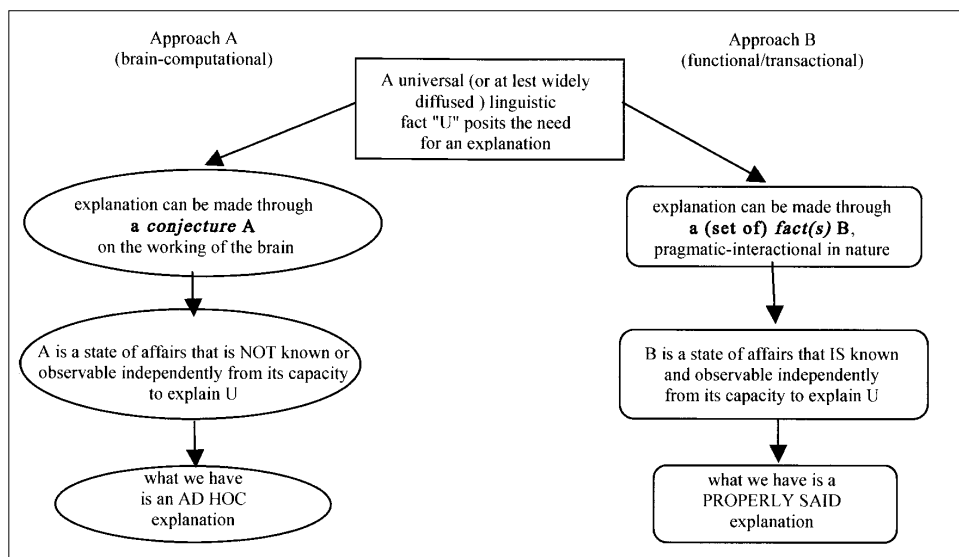
²³ Interim hypotheses, among others, in Edelman (1987, 1992, 2007).

Why subjective experience emerges from appropriate neuronal activities may be no more answerable than similar questions about other fundamental phenomena. That is, why does mass have inertia? Why do masses exhibit gravitational attraction? Why does matter behave both in wave-like and quantal fashions? [...] The emergence of conscious subjective experience from nerve cell activities is still a mystery.

This is the extent to which we can “grasp” the relation between the mind (including language) and the brain. Moreover, we have a sufficiently wide-ranging knowledge of how language works, consisting in the accurate description of hundreds of languages and a wide agreement on the existence of dozens (possibly hundreds) of linguistic “universals”²⁴, i.e., properties whose existence is hardly ascribable to mere hazard. Among these, what we have called DFs are the most central and necessary to the nature of language itself, but of course not the only ones.

Now, the conceptual links we can establish between our knowledge of language and our knowledge of its anthropological bases vary dramatically according to whether we select brain-computational or functional/transactional explanations. This is shown in Diagram 1:

Diagram 1. Two explanatory paths



²⁴ It is not crucial to our analysis whether the features that are usually presented as linguistic universals (especially those that are not DF directly descending from the notion of “language”) are really universal or just strong tendencies. As a matter of fact, we basically agree on the position held by Evans & Levinson (2009) on the matter.

This affects the interpretation of any linguistic fact. For instance, we may accept as universal that in any language the existence of dedicated reflexive pronouns (as opposed to personal pronouns) for the first person implies the same for the second person, and so on for the third person (cf. Comrie 1993). In such a case, we might search for an explanation in terms of brain organization (approach A). Since it is still impossible to establish what could be in the brain, for instance, such things as the anatomical/physiological bases for pronouns, we are compelled to suppose a hypothetical “structure in the brain” whose existence may, among other things, decide that any language must have dedicated reflexive pronouns more strongly for the third person than for the second, etc. It may be the right guess, but there is no way to check it independently, by means of specific, qualitative inquiry of brain phenomena. As a consequence, if such a structure is meant to be an explanation for linguistic facts, it is an *ad hoc* explanation, circular and tautological in nature.

Under such conditions, the best we can do still is to assume a specialized brain module as an explanation for linguistic facts, but just in case there is no other possible path to get an explanation for those facts. Otherwise, solutions in terms of “brain structure” should be regarded as violations of Occam’s razor, since what they definitely do is creating *entia (explicationis) praeter necessitatem* from scratch, in order to account for things that can be explained more simply in other terms.

Now, crucially, there hardly exists any linguistic universal that cannot be (at least in part) accounted for in terms of pragmatic constraints. This is obviously also the case for the distribution of reflexive pronouns we have just alluded to (cf. Lombardi Vallauri 1999).

It is perhaps worthwhile remarking that a very important sector of recent linguistic studies, namely typology, seems to be neutral with respect to the present issue. The quest for regular differences between languages, which may be regarded as the logical counterpart of the search for linguistic universals, can be carried out (and is done indeed) in both perspectives: once it is made clear what limits are set to actual language variation, the problem remains open whether such limits are imposed by a set of structures in the brain or by the pragmatic constraints that influence all languages.

3. On Natural Constraints

Let us now turn to the set of “natural constraints”²⁵. They have various sources. Some are due to the need to represent the actual structure of the world, as well as

²⁵ The only kind of “constraints” Chomsky (2005: 6) seems to admit are “computational constraints” allegedly imposed on language by “genetic elements”. The assumption that physical reality (“organism-internal factors”) *does* affect the structure of language – or at a minimum verbal

the output of other systems of representation of reality, which in turn can be meta-represented by language. Some other constraints depend on the need to carry out a set of micro-pragmatic functions, such as presenting events from different points of view, underlining certain contents with respect to others, etc. Moreover, some are due to the internal forces that are essential to any symbolic system, especially if it must “run” (like a software runs on a hardware) on a machine of limited capacity.

In sketching them we shall have recourse to some already acquired tenets, to which various new suggestions will be added. Another paper (Lombardi Vallauri & Simone to appear) will be devoted to describing all such constraints. Here we deal particularly with those that are due to the physical limitations imposed by the world and the human body (3.1.) and by the social conditions of language use (3.2.).

3.1. Physical determinism

Within the transactional approach, language is partly, but substantively, determined by the physical properties of its user and by his limitations as information processor. To put it otherwise, several (if not all) of its aspects are made in such and such a way because it is bound to be used by humans with such and such properties. This affects dimensions that have an obvious physically manifest interface (e.g., sound pattern, intonation, pauses) as well as more abstract, less easily accessible, aspects (morphology, syntax, semantics, and so on). The effect of physical determinism may be more conspicuous on the *signifiant* plane, but it is not less effective on the *signifié*²⁶.

We formulate this assumption as a macro-constraint:

- (1) *Physical Determinism*: language is produced and processed by human users with finite properties (e.g., lung capacity, short- and long-term memory, speed and capacity of information processing and concept formation, structure of the articulatory/auditory channel, motor output speed, etc.).

In other terms, language users, and consequently languages, can do certain things but *not all* imaginable things. The “things” languages do first (i.e., more

behaviour – was also taken into consideration by Hauser *et al.* (2002: 1571): see for example the reference to the fact that “lung capacity imposes limits on the length of actual spoken sentences, whereas working memory imposes limits on the complexity of sentences [...]”.

²⁶ In this section we insist on the former aspect (the physical determinism affecting the *signifiant*). As regards a possible psychological and (more in general) biological determinism on meaning, the issue is even harder to account for. We will devote some remarks to it in Lombardi Vallauri & Simone (to appear).

stably and frequently over time, more widely over space, etc.) are the most “natural” ones, i.e., those most strictly respecting the natural properties of users²⁷.

Several implications of narrower range derive from (1).

(1.a) *Determinism of physical equipment on some aspects of language*: various aspects of language structure directly depend on, and are affected by, corresponding properties of the speaker’s physical equipment: thus, language is partly modeled by the users’ body.

Intonation is crucially dependent on breathing, for example. It is widely accepted that syntactic units tend to coincide with breath-groups. As Lieberman (1984: 118) remarks, “Human speakers usually segment the flow of speech into sentences, or other speech units, by grouping words in complete expirations”. At a more microscopic level, in the syllable there is a nucleus constituted by an acoustically more salient segment, whose rationale is probably to make them more audible.

(1.b) *Tendency to least effort in living systems*: what takes less production and processing effort is preferred to what takes more, in language and elsewhere.

This principle – formulated as early as in the ’30s by G. K. Zipf and resumed later by several others²⁸ – vibrantly revives in current linguistics. Usage-based analyses incorporate it proposing various applications of it (Bybee 2006; Tomasello 2003, 2008), and it is also corroborated by numerous acquisitions about biological systems, where the “economy” hypothesis seems to be accepted on a very large scale²⁹.

²⁷ This term obviously alludes to the vast tradition of “natural” linguistics, that has investigated in many fields, everywhere advocating the crucial role of distinguishing what is more from what is less “natural” from the user’s point of view. See Dressler (1990), Dziubalska-Kolaczyk & Weckwerth (2002).

²⁸ See Zipf (1935) and later Martinet (1955). An earlier, neglected but path-breaking investigation was Frei (1929), where errors in language behavior were explained as effects of a set of “natural” drives. A historical survey in Pustet (2004); a theoretical discussion in Simone (1990). One of the most insightful views in this vein is Hawkins’ (2004) idea is that “grammars are ‘fixed’ or ‘frozen’ performance preferences”.

²⁹ This may be observed both in a linguistic and a general perspective: “One natural property of efficient computation, with a claim to extra-linguistic generality, is that operations forming complex expressions should consist of no more than a rearrangement of the objects to which they apply, not modifying them internally by deletion or insertion of new elements. If tenable, that sharply reduces computational load: what has once been constructed can be ‘forgotten’ in later computations, in that it will no longer be changed.” This property is referred to as “cyclic computation” (Chomsky 2005: 11; Frampton & Gutmann 1999).

(1.c) *Efficiency of sound channel in physical space and for human perception*: a language endowed with a sound expression (i.e., a “verbal” language) is more efficient than any other semiotic system accessible to humans (as a proxemic-gestural one would be).

This point, which is a consequence of (1.b), has been emphasized several times (e.g., in Hockett 1960). We limit ourselves to recall its main claim. A language whose expression is sound can travel more easily over space and is more efficiently transmissible. This is since (a) the oral/auditory channel is able to keep distinct both in production and in recognition a higher number of units (Lieberman 1984, 1991), (b) sound can be produced/recognized at a relatively higher speed rate, (c) the oral/auditory channel, because of its very nature, allows communication in discontinuous environments, (d) simultaneously, it allows to keep eyes and hands free for other tasks (Hockett 1960; De Mauro 1988; Simone 2007b: 333).

(1.d) *Determinism of expression on language*: the specific expression used in a language (in verbal languages, typically sound) crucially affects the general architecture of language itself up to a fine-grain level³⁰. In other terms, modality is not indifferent vis-à-vis language.

Better than by verbal languages, this point is illustrated by Sign Languages, where the peculiar expression and the possibility of activating simultaneously various sources of sign-production (hands, face, body posture, etc.) makes a rich variety of grammatical features possible. Such features are largely unknown to, and impossible in, verbal languages. They include a rich TAM system (Janzen 2007) and the crucial resource dubbed “body partitioning” (Dudis 2004, with reference to Fauconnier 1994). It allows one and the same signer to dedicate a distinct part of his/her body to represent each of the speakers whose discourse s/he reports: for instance right hand + mouth gestures may be reserved to encode the messages of one speaker, body + left hand + eye gaze to those of another one (Dudis 2004: 235)³¹. In such a way the same signer can represent two subjects uttering two separate discourses at the same time, with a perfectly efficient partitioning. The grammar of this language gains by the peculiar nature of its expression modality.

³⁰ “Expression” is obviously taken in the Hjelmslevian sense. This is contrary to Chomsky’s (2005: 10 and passim) claim about the “modality-independence” of language. (It is obvious that modality-independence is but a reformulation of the “indifference to substance” described above.) The strong predictive capability of (1.d), on the other hand, stands out in the non-arbitrary features of Signed Languages and in the huge, usually underestimated field of onomatopoeia and ideophones in languages (Deacon 2003).

³¹ Verbal languages respond to such a richness – that they lost over time – through the residual resources of “polyphony” (Nølke 1993, 2001) and the creation of “mental spaces” in utterances (Fauconnier 1994).

(1.e) *Limitations of the articulatory and auditory organs*: given their physical configurations, human articulatory and auditory organs do not admit an unlimited number of phonetic gestures and phonemic distinctions.

Phonetic and phonemic resources are both limited in number and relatively homogeneous in nature. Their modification over time is partially due to the need to adapt the sound pattern to such limitations, even though various kinds of events may trouble this process.

The higher efficiency of a sound-based expression is balanced by the fact that human articulatory and auditory organs cannot process an unlimited number of recognizably different sound gestures (Lieberman & Bloomstein 1988; Lieberman 2002; Hagège 1993, 1995). To overcome this inconvenience, some combinatory device is required, able to cope with the huge variety of needs languages respond to. The availability of such a device (see also below) is a clever, amazing peculiarity of human language³².

(1.f) *Deployment of linguistic signal in time; linearity*: since the expression of language is mainly based on sound, messages must be coded linearly by linking a unit to the following one. Non-linear phenomena (as suprasegmentals: prosody, intonation, etc.) counterbalance the effect of linearity without damaging its architectonical import.³³

The forced linearity of language – holding at almost all levels of analysis³⁴ – blurs the non-linear structure contained in the mere succession of units. As a consequence, a part of the information about utterance structure is likely to be lost and another part has to be recognized through complex analytic operations³⁵.

3.2. The social bond

As predicted by the transactional option, humans use language not only to exchange information but also (even mainly) to perform social actions of several types and levels. This brings to the following Macro-Constraint:

³² As we already pointed out, some regard this feature (“discrete infinity”) as probably the very core of the language faculty. This perspective has been authoritatively emphasized, e.g. by Hauser *et al.* (2002). See for other aspects Simone (2007b: chap. 3).

³³ This formulation is deliberately drastic since it ignores prosody altogether. This one has obviously to be given its place, but it would not affect our generalization anyway.

³⁴ To a certain extent, this holds at the phonological level (morphs are made of sequences of phonemes) as well as at the morphological (morphs agglutinate to form words) and also the syntactic one (words and other syntactic units link to each other in succession to give place to higher level units) (cf. Simone 1990: 334).

³⁵ Writing systems indirectly witness the same limitation, even to a higher extent.

- (2) *Pragmatic functionality*: Language performs a set of pragmatic functions that are specified by the situations it is used in: it may be required to do certain things but *not all* imaginable things. The list of the “social things” it can do is limited and mostly universal.

Since the pragmatic needs that languages serve are common to all humans (with some possible culture-dependent differences), languages have resources to perform the basic pragmatic tasks. This brings us to a more specific constraint:

- (2.a) *Pragmatic homogeneity across languages*: since languages perform a set of homogeneous pragmatic functions, they must be equipped accordingly. Some resources for such a goal may be typologically related to each other across languages, others may be independent³⁶.

A typical illustration of this is illocution. There is no reason why different cultures, and different languages accordingly, should differ as regards the illocutionary functions one can perform through his/her language. All languages are endowed with means to produce assertions, questions, requests, orders, and other basic illocutionary acts³⁷. Moreover in languages some typical, cross-linguistic associations of form to pragmatic functions can come about: such is for instance the possibly universal use of interrogations as forms for orders, commands, etc., or the wide-spread use of free conditionals to code a relatively stable pragmatics (mild orders, etc.: Lombardi Vallauri 2004).

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³⁶ According to Lehmann (personal communication) this formulation is valid up to a certain point. Some languages for instance have an “imprecativ” sentence type, others do not, and in any case the lower-level illocutionary acts (for instance, baptizing) are largely culture-specific.

³⁷ This term is by Hengeveld (2004); see also Cresti & Moneglia (2005).

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