Language: From Sensory Mapping to Cognitive Construct

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This paper places embodiment in an evolutionary perspective and endeavors to show that as incipient speakers began forging a linguistic system, they molded their grammatical distinctions and syntactic functions on their perception of the outside world, but that in the course of evolution, these perceptually-tinkered features were gradually replaced with mental constructs, specifically conceived to serve linguistic purposes and serve them with increased potentiality and greater efficiency. The shift from perceptual to conceptual implements is perhaps most conspicuously visible in writing, where open-ended figurative hieroglyphs were replaced with a small set of abstract letters, but the process is pervasive. In syntax, the phenomenal notion of agency, so deeply anchored in our activities, and the entire grammatical system built thereupon were replaced with a model where agency is irrelevant and syntax is structured on the purely mental constructs of subject and object. The paper continues with further cases of disembodiment.

Keywords: argument alignment; cognitive constructs; embodied language; language evolution; perceptual mapping

1. The Canonical View Questioned

For some fifty years the prevailing theory in mainstream linguistics was Chomsky's nativist hypothesis. It stated that in the course of their evolution humans became endowed with an innate linguistic model that enabled them initially to build grammars and thereafter learn in their early years the language spoken in their linguistic environments. Since this innate model was postulated to have genetic correlates much like "an organ such as the eye or heart" (Chomsky 1980: 37), and since, barring a major mutation, these genetic correlates would permanently remain the same, all languages — extent or extinct — were by way of corollary ruled to be gratuitous variants of one another. This theoretical framework meant in turn that while languages do undergo changes, those changes are gratuitous: "There is no more reason" stated Postal emphatically, "for languages to change than there is for automobiles to add fins one year and remove them the next" (1968: 283). Languages, therefore, do not evolve; they remain with neutral changes the external manifestation of a

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permanent innate model.

Initially, the nativist theory and its expression in formal language exerted an undeniable fascination, but more and more it became apparent that the necessary empirical support was lacking (cf. Vargha-Khadem *et al*. 1995: 930; see also Vargha-Khadem *et al*. 1998: 12699). Today, with counter evidence mounting, the nativist theory is openly contested. In a seminal paper published in a journal that once hosted Pinker and Bloom's comprehensive presentation of the nativist tenets, Evans and Levinson argued that

> [t]he claims of Universal Grammar … are 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 centre stage (2009:429).

Speaking of a follow-up paper (Dunn *et al*. 2011) published by a partially different team, but from the same research center, the lead author told BBC online (Apr. 15, 2011):

> We show that each of these [four] language families evolves according to its own set of rules, not according to a universal set of rules.
>
> That is inconsistent with the dominant 'universality theories' of grammar; it suggests rather that language is part of not a specialised module distinct from the rest of cognition, but more part of broad human cognitive skills.

The cumulative message of the two papers, both based on a vast survey of languages, is clear and unmistakable: There is no linguistic evidence for the existence of a universal grammar coded in our genes, and languages pursue their own individual evolutionary courses.

The Dunn *et al*. paper is by no means flawless, and suggestions have been made to improve the approach (cf. e.g., Longobardi & Roberts 2011), but it does display a rigorous methodological approach applied, admittedly, to only one feature, namely the shift from head-last to head-first word order, but conducted across no less than one third of the world's languages. Their conclusion is therefore well grounded: Languages evolve and they set their own evolutionary courses. Dunn and his colleagues' innovative paper marks an important step in the study of linguistic change, but it begs the next one: If changes are discussed in an evolutionary framework, the discussion must then invariably include an assessment of the selective advantages of the output over the input. Such comparative assessments are indispensable if we are to understand why such sweeping changes have taken place and/or are ongoing, why they normally are irreversible, and why some applications of a broad shift may take exception (cf. e.g., the situation in English, where modifying adjectives are head last in a predominantly head first language).

The application of evolutionary criteria to the study of language has also been my pioneering activity for decades. Without a computational apparatus, but on the basis of diachronic data carefully placed in their historical context and

properly extrapolated material from language typology, I have been arguing that, under normal circumstances, languages proceed in the direction of ever-higher efficiency, upgrading the power of expression of their implements while reducing their neuromuscular cost. Each language pursues such a course on its own — at its own rate and along its own pathway. Since no new alternative has only advantages, and no new alternative is the only one to present advantages, it is understandable that each language makes its own choices and takes its own pathway towards greater efficiency (cf. Bichakjian 2002 for an elaborate presentation).

2. The Present Objective

In this paper, I will argue that one of the important ways of achieving higher efficiency has been the shift from linguistic features initially molded on the sensory mapping of the external world to cognitive alternatives especially conceived to serve linguistic purposes.

This observable trend in the history of languages ties in with the adaptive nature of language, whose phylogenetic acquisition provided humans with a cognitive dimension that enables us to elaborate knowledge "not only from sensory mappings that we share with other anthropoids as well as most mammals, but by important inputs to the mapping that comes from our language 'sense' as it has evolved in *Homo sapiens*" (Jerison 2001: 384).

The shift from perceptual to conceptual implements also ties in with the embodiment issue, and the observed linguistic process can be seen as a case of disembodiment. The units of measurement provide a clear illustration. The ancestral ones were generally based on the dimension of body parts — they were literally embodied: The inch was the standard width of the thumb, the foot the standard length of the eponymous organ; the Egyptian cubit represented the length of the forearm, and the yard that of the extended arm. With notable exceptions, these anthropomorphic units of measurement, molded on the perception of the outside world, have been replaced with the conceptually devised metric system, which has considerable selective advantages. The evolution of the units of measurement clearly illustrates the shift to and thence the evolutionary trend toward disembodiment, while the cases of resistance to the modern system reveal the clash and competition between visceral feelings and mental deliberation. In linguistics, the older quantitative and qualitative vowel alternations (cf. Lat. *ĕdimus* vs. *ēdimus* 'we eat *vs.* we ate' and Engl. *we break* vs. *we broke* anchored in our potential for rhythmicity would fall in the category of embodied features whereas the modern opposition based on mentally created auxiliaries would constitute a case of disembodiment.

3. From a Perceptual Beginning

Perhaps Athena burst forth from Jupiter's forehead fully armed, but that certainly was not the case of language, and the idea of treating language as an all-

or-none entity is counterfactual. Language developed in the course of time through the speakers' unconscious, yet intuitively guided efforts. Linguists are unfortunately unable to reconstruct the utterances of incipient speakers, but they have access to sufficient data provided by internal reconstruction and typological surveys to trace the developmental trend. Incipient speakers started from scratch, but *ex nihilo, nihil fit*, from nothing, nothing comes. We all know that animals do not speak, but it is part of their survival strategy to observe and categorize the elements of the outside world and the activities taking place around them. So, when incipient speakers began cobbling a system of verbal communication, they brought to the task the knowledge and experience that were already theirs. Since that knowledge was essentially perceptual, the linguistic system that they first built was based on distinctions and functions molded on those observed in the outside world. These were gradually either abandoned when they proved unnecessary or replaced with mentally-constructed alternatives that provided greater efficiency.

The evolution of languages has therefore been a steady shift from perception- to conception-based grammatical distinctions and syntactic functions. This general trend can be observed in several important parts of language, but it is perhaps most conspicuous in the evolution of writing and the resulting development of the alphabet. It is true that the graphic representation of speech only plays an ancillary role, but its special illustrative value justifies its being included in the discussion before the focus is laid on the evolution of nouns, the development of adjectives, the realignment of arguments, the rise of temporal distinctions and the coining of marking devices.

3.1. The Evolution of Writing: From Pictograms to Letters

The evolution of writing is well known, and its course from perceptual pictograms to conceptual alphabetic letters is no secret. When they wanted to commit a word to a slab of stone, a clay tablet, or a papyrus scroll, scribes sketched the image of the referent, provided, of course, the referent was concrete. So, the outline of a snake, for example, represented the word *snake*, but also the words for items and attributes associated with snakes, such as *venom* and *perfidy*. As such, the pictograms functioned as ideograms — they were meant to be read as words, the word for the depicted item or those associated therewith.

But pictograms could also have a phonetic function, one with far reaching consequences for the history of writing. In the absence of the diacritic mark indicating that the image must be read semantically, pictograms could be read phonetically. An imaginary English example can illustrate the point. The word *tail* can easily be represented with the image of a tail, and when accompanied with the proper diacritic mark the pictogram will refer to the organ and its figurative and associative meanings. But without the diacritic mark, called determinative, the image simply refers to the sound of the word *tail* and as such could also be used to represent the less "photogenic" but like-sounding word *tale*. The pictogram for the word *tail* could also be combined in a rebus with the image of an *oar* to form the hieroglyph of the word *tailor*.

It is this phonetic use of pictograms that led to the development of

alphabetic letters. It occurred over time through a two-track process, one mental, the other graphic. Mentally, the initial consonant was extracted out of the continuous flow of speech sounds associated with the word and recognized as a specific entity, an entity without a semantic backing, but an entity, nevertheless. Graphically, the stylized and simplified form of the image of the full word became the sign of that abstract entity, the sign of a speech sound. It took more than two millennia for the Greek alphabet to evolve out of the Egyptian hieroglyphs. The process was admittedly slow, but writing systems did come up with conceptual alternatives for the initially created perceptual implements, and it was well worth the time and effort because an open-ended array of 700 hieroglyphs was replaced with a set of less than fifty characters that can code for an infinite number of words and that can, barring accidental cases of homophony, do so unambiguously. Writing systems became fully accurate and considerably more efficient. It does require a formal learning process, but considering the yield, it is well worth the effort (for a less cursory presentation of the evolution of writing systems, cf. Bichakjian 2002: 221–258; see also the classic works of Diringer 1948 and Gaur 1984).

3.2. Noun Classes

Since we cannot reconstruct the utterances of incipient speakers, it is impossible to tell with certainty whether the first nouns were subcategorized in classes (human, animal, vegetal, solid, liquid, long, compact, etc.), but the existence of such grammatical distinctions in aboriginal languages, the survival of active/stative doublets such as the Germ. *Wasser* 'water', neuter, and the Fr. *eau* (< Lat. *aqua*) 'water', feminine and the fact that in the Indo-European languages neuter nouns are unmarked in the nominative suggest that the prototypical vernaculars probably subcategorized nouns according to the physical characteristics they attributed to their referents. The fact that the ancestral language had two words for 'water' — one neuter, i.e. inanimate, another feminine, i.e. animate — suggests that the ancestral speakers had a dual representation of 'water'. In one perspective, they perceived 'water' as a material item and assigned it to the class of inanimate nouns, in the other as an entity endowed with cleansing virtues or calamitous powers and assigned it to the class of animate nouns. The absence of nominative markers of neuter nouns suggests that their etyma in an earlier language belonged to the class of nouns that could never appear in the agentive case — the forerunner of the nominative case — because their referents, like that of Germ. *Wasser* could never be the agent of an action (cf. *inter alia* Ashton *et al*. 1954 for an example of a language with noun classes, Meillet 1965: 219–220 on doublets, Diakonoff 1965: 55–56 for class evidence in Afro-Asiatic, and Schmidt 1979: 337 *et seq.* on neuter nouns).

The class distinction has not been completely eliminated everywhere; it often survives in the form of grammatical gender. The lineage is not complete and continuous, but one may reasonably surmise that incipient speakers built their grammar with distinctions observed and experienced in the outside world. But with speech making successive generations of speakers capable of greater abstraction, these perceptual markers proved to be redundant and thereby more

taxing than informative. Classes gave way to grammatical genders, which in turn were gradually reduced or eliminated altogether as in the case of English, but also Armenian, Bengali, Chinese, and many other languages.

3.3. The Adjectival Gap

While the subcategorization of nouns in classes such as human, animal, vegetal, solid, liquid, long, compact, etc. was a likely feature of incipient speech, the distinction between active and inert or stative nouns was fundamental. Nouns, like their referents could be active or stative. In Latin the words for 'hand', 'foot', and 'tongue' were masculine or feminine, i.e. originally active since these are active organs, while the words 'head', 'heart', and 'liver' were neuter, i.e. originally stative since they were considered to be the seats, respectively, of intelligence, memory, and emotions. The active/stative distinction also applied to verbs: In Latin, 'to kill' was an active verb since it implies an activity on the part of the agent; 'to die' was a deponent since the experiencer is the seat of the action, not its author. So, originally, or at least in very ancient times, verbs were subcategorized into verbs of action and verbs of state, and since being white or red was a state, the characteristics that are expressed with adjectives in modern languages were expressed then with verbs of state (cf. Klimov 1979: 328 and fossilized tokens such as Lat. *albeo* 'to be white', *rubeo* 'to be red'). It stands to reason that the incipient speakers' first task was to label objects and coin words for actions and states. Conceptualizing quality and developing adjectives to express it came about later — the new part of speech needed greater mental application and higher abstraction.

3.4. Argument Alignment from Agent/Patient to Subject/Object

The subcategorization of nouns and verbs in active and stative classes is directly linked to how arguments were aligned in ancient times. The system was based on the incipient speakers' observation of events in the outside world. When narrating the event of a hunter killing an antelope, *hunter* would be in the agentive case and so marked, while *antelope* would be in the "patientive" case and left unmarked. Since the "patientive" form is the unmarked or bare form of the noun, the "patientive" case has been called the "absolutive" case, while the agentive case has been dubbed "ergative" (< Gk. *ergon* 'deed, action'). However, if an old man was there, his witnessing the scene of the hunting would be expressed with a stative verb, and *old man* would appear in the absolutive case, not in the ergative one, because a witness is not an agent. Both the old man and the antelope are considered to be part of the scene, not one of the movers — hence their being treated as patients and put in the absolutive case.

No exceptionally deep insight is needed to see that the incipient argument alignment was based on the perception and interpretation of events in the outside world. Since actions have agents and optionally one or more patients, their roles were carried over into grammar and made into syntactic functions. It should also be observed how important agency was considered to be. Not only *dying, witnessing*, and the like are not activities and the one involved does not

qualify as an agent, but the fact that it is the ergative form that carries a morphological marker indicates how important agency was — in real life and in grammar.

Gradually this perceptual model morphed into the conceptual one of the nominative languages, where the active/stative and agent/patient dichotomies borrowed from the outside world no longer play a role. The key players of the new model are subject and object, mentally constructed functions that make it possible for any noun to be the subject of any verb and for speakers to describe actions in all perspectives — the agent's, the patient's and even the beneficiary's. Cf.

(1) The hunter showed the antelope to the old man.

(2) The antelope was shown by the hunter to the old man.

(3) The old man was shown the antelope by the hunter.

The shift from perceptual to conceptual grammatical functions has thus made grammar more flexible and more powerful.

3.5. Breaking the Bonds of the Present

While the thoughts of incipient speakers no doubt wandered about the experiences they had had in the past or those they foresaw in the future, speaking always took place in the present, and, in the present, actions were either ongoing or completed or possibly resulting from previous actions (cf. Germ. *wissen* 'to know', akin to Lat. *videō,* meaning originally 'to know for having seen').Those were the ancient verbal distinctions — all of them in the present. They were not temporal, but aspectual, because initial speakers expressed what they beheld in the material world at the time they spoke. The three ancestral aspects were called *present, aorist,* and *perfect* in the traditional terminology; *imperfective, perfective,* and *stative* are the preferred labels today.

As languages evolved, aspectual distinctions did not disappear altogether. English, for instance, makes an **aspectual** distinction — aorist *vs*. perfect, or perfective *vs*. stative — between *I ate* and *I have eaten*. Likewise, but somewhat differently, French and the romance languages in general make a distinction between the perfective and imperfective aspects of the past tense as in *j'ai mangé* vs. *je mangeais* 'I ate *vs*. I was eating'. Aspect is no doubt a useful distinction and that's why it has been partially preserved, but one should not lose sight of the fact that as languages evolved aspectual systems as a whole have morphed into temporal systems (on the ancestry of the aspectual system and its shift to a temporal one, cf. *inter alia* Meillet 1928: xii and Kuryłowicz 1964: 130). Just as motion picture cameras provide a kaleidoscopic view of events, temporal systems enable speakers to travel through time, narrate events of a foregone past, and structure those of a yet-to-occur future. Developing such a verbal system required a mental effort, a far greater effort than witnessing that an action is ongoing or completed.

3.6. Grammatical Marking: From Modulation to Free Morphemes

Let us imagine the following predicament of incipient speakers. They have coined nouns for objects and verbs for actions and states, but how are they going to make a distinction between an on-going action and one that is completed, one that is performed in one go and one that is performed repeatedly and in reduced form, or one performed normally and the same one with especial intensity. The original impulse seems to have been some form of stem modulation: Either the quality or the quantity of the root vowel was changed or the initial syllable was repeated — along with the change of quantity was at times a concomitant change of quality while stem reduplication often triggered a vowel reduction in the added syllable and occurred at times along with a vowel change in the stem (cf. e.g., Gk. *d**é**rkomai/déd**o**rka* I see/I have seen', Lat. *v**ĕ**nimus/v**ē**nimus* 'we come/we came', and *f**a**cimus/f**ē**c**i**mus*' we make/we made', *pendimus/**pe**pendimus* 'we ponder/we pondered', *currimus/**ce**currimus* later by assimilation *cucurrimus* 'we run/we ran', and *c**a**nimus/**ce**c**i**nimus* 'we sing/we sang'. Reduplication was also used elsewhere as in *quisquis* 'whoever' lit. 'who-who', *quōquō* 'wherever' lit. 'where-where' and *alter alterum* 'each other' lit. 'other of two-other of two'. Outside the Indo-European family, reduplication can also serve to express the intensive or iterative forms of verbs (cf. Arabic *kas**s**ara* 'he or she broke' vs. *kas**s**ara* 'he or she smashed to bits' and Swahili *piga* 'to strike' vs. *piga**piga*** 'to strike repeatedly') or even the plural as in Malay *rumah* 'house' ***rumah**-rumah* 'houses'.

While some cases of vowel alternation have survived, especially in the Germanic languages (cf. Engl. *sing/sang/sung*) and reduplication can occur today in baby talk and pet names (cf. Engl. *itsy bitsy*, Fr. Riri < Henri), stem modulation has generally been sidelined in the course of evolution and replaced with suffixes and infixes, which in turn have been partially replaced with particles and full-fledged words serving grammatical functions.

Stem modulation is not a feature molded on occurrences taking place in the outside world, but there is something physical or even visceral and echolalic about alternations and reduplications. These are indeed embodied linguistic features. The first task of incipient speakers was understandably to label items and actions and states; they then bent and remodeled these contents words to form their paradigmatic variants. But with the use of language stimulating greater abstraction and increased use of mental power, over the years, speakers developed a broad range of specific morphological segments with grammatical functions as referents. The following step was having full-fledged grammatical words next to the first coined contents words. That was a major step in the conceptualization of grammatical implements. Function words are sometimes called "empty" words. The adjective *empty* contrasts with *contents*, but it also reveals the level of abstraction and the mental effort that is required to coin words that have "no" contents. The three steps can be observed in the following sequence from Early Latin to Modern French, where stem modulation is successively replaced first with suffixation, later with the use of an auxiliary.

(4) cano/**ce**c**i**ni > canto/cant**a**v**i** > je chante/j'**ai** chanté
'I sing/I sung'

These evolutionary steps, which constitute a case of disembodiment, took place because each new alternative had selective advantages that the ancestral one did not have. Stem modulation has a certain charm, echolalic or cadential, but such processes can only provide a limited number of distinctions, while suffixation offers unlimited possibilities. Suffixes are indeed open ended and as such more advantageous, but they have their own downside: They can trigger morphological irregularities and thereby create language acquisition problems and delays (cf. Slobin, 1971: 347 on the difficulty of acquiring flectional systems). Function words have no quantitative restrictions; they are easy to acquire and powerful to operate. While the shift to mentally-generated grammatical markers and the corollary disembodiment were driven by the pursuit of greater efficiency, it should be born in mind that no feature is exclusively advantageous, nor exclusively deleterious. Mentally generated linguistic implements have indeed the selective advantage of being more efficient, but embodied ones can also have theirs, such as the charm of reduplicatives in hypocoristics and nursery rhymes (e.g. *The Incy Wincy Spider*) and the more subtle pleasure of alliteration in adult language.

4. The Evolving Instrument of a cerebral species

It is a trivial observation that we humans do not have the tigers' fangs, the antelopes' speed, the eagles' wings, or even the turtles' shield or the elephants' mass. We have none of the weapons and none of the defenses that other animals have, but we have a major trump card: We have, relative to our size, an exceptionally large and highly-developed brain (cf. *mutatis mutandis* Gould 1977: 402). Brain power is our most valuable asset. We do not have fangs, but we have invented fire arms to hunt with; we cannot run as fast as antelopes, but we have engineered automobiles that transport us even faster; we cannot fly, but we have built aircrafts that make air travel not only possible, but fast and effortless.

Likewise, humans have started with rudimentary linguistic implements and developed ever-more efficient alternatives from agent-patient to subject-object argument alignment, from verbs of state to adjectives, from stem modulation to suffixation and thence to an array of free grammatical morphemes such as pronouns, prepositions, auxiliaries, adverbs, and articles, and also from glottal and glottalized consonants, which involve an "intricate coordination of the actions of the larynx with the actions of the articulators in the mouth," to simple oral consonants (Maddieson 2011).

Unlike all other species, humans are the only ones that have endeavored to find mentally generated and, as such, ever more efficient alternatives to the physical resources that are part of our endowments or immediately available in the outside world. The shift that was observed in language and also elsewhere from prototypes molded on the perception of objects and actions around us to mentally designed alternatives is therefore part of a truly human strategy.

It is our cerebral nature that explains the developments that were discussed in the foregoing, and they in turn support and confirm the view that language is not an instinct or a steady-state attribute coded in our genes, an organ as it was once claimed (Chomsky 1980: 37), but an instrument that keeps evolving — becoming ever more cerebral and, by so doing, ever more efficient.

Glossary of some of the technical terms used in this paper

Argument alignment. The patterning of elements in a sentence. The **nominative** (also called **accusative**) **alignment** is that of the nearly universal model composed, independently of their order, of a verb, its subject, and optionally one or more objects. The much less common **ergative alignment** is a model based on the distinction between agent and patient, and active and stative verbs. Depending upon whether the action has an actual author or not, the verb will be active and combine with an agent in the ergative case and eventually a patient in the absolutive case, or stative and will combine simply with a patient in the absolutive case.

Aorist. The traditional word for the perfective aspect, which denotes an action apprehended in its completion. Also used as a temporal distinction to denote a point action in the past without resultative connotations. Cf. e.g., *I ate* as opposed to *I have eaten*, which has resultative connotations meaning 'I am full', 'I don't have to eat', etc.

Aspect. Whereas temporal distinctions are about the relative time of the action, namely past, present, and future, as in *I see, I saw, I shall see*, aspectual distinctions apply to the flow of the action. The main aspects are imperfective, perfective, and perfect, as in *I was eating, I ate, I have eaten.* Pedagogical grammars all too often conflate tense and aspect, but seen properly, the distinction between *I see* and *I saw* is temporal, between *I saw* and *I have seen* is aspectual.

Echolalia. Feature of two-syllable words where the second is much like the echo of the first. Cf. e.g., *bye-bye*, *oink-oink*, *tic-tac*.

Embodied language. Items of language possibly shaped by aspects of the human body.

Marker. A morphological device — often a suffix — used to indicate a paradigmatic variant. In English, *–s* is the regular plural marker of nouns, while *–ed* is the past tense marker of regular English verbs.

Marked/unmarked. These have two meanings:

They may simply refer to the presence or absence of a marker. In English, plural nouns are marked, but plural adjectives are unmarked.

In the **theory of markedness, marked** means a step or steps away from the basic or most natural variant. The vowel [ɛ] as in French *mère* 'mother' is unmarked — it is the most natural of all vowels — but the French vowel [œ], as in *sœur* 'sister', is marked for roundness because the spontaneous pronunciation of a front vowel is without lip rounding. The lip rounding is achieved through an extra effort— hence the marking. The vowel [œ̃], as in French *brun* 'brown', is doubly marked since it requires two extra efforts: One for lip rounding, one for nasalization.

Universal Grammar is the set of the structural properties common to all natural languages claimed to be hard-wired into the human brain.

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