Language Faculty, Complexity Reduction and Symmetry Breaking
Anna Maria Di Sciullo, Université du Québec à Montréal

1. I assume that the Language Faculty is stable, it does not vary though time and space, and that language development requires experience (Chomsky 1995, 2005, 2011). I develop the view that language evolutionary development is the result of the interaction of the language faculty + experience with factors reducing complexity (Third Factor).

2. The relation between the language faculty and principles reducing complexity has been part of the research agenda in the generative enterprise since the 50's. Framed within Biolinguistics, the principles of efficient computation can be thought of as being natural laws affecting the computations of the Language Faculty (No Tampering Condition, Derivation by Phase, Minimal Search, Pronounce the Minimum, a.o.). Other complexity-reducing factors include the mechanisms restricting the set of possible acquirable grammars (Yang 2002, Niyogi 2006, Niyogi and Berwick 2009). Yet other such factors may come from natural processes, such as symmetry breaking (Di Sciullo 2011, 2012). Symmetry breaking is a process that brings a system from a symmetric state ($\forall a,b \in X$, $aRb \Rightarrow bRa$) to an asymmetric state ($\forall a,b \in X$, $aRb \Rightarrow \neg bRa$), and which has been argued to affect syntactic derivations in Moro (2000).

3. Several works in evolutionary developmental biology provide evidence that variation in biology is symmetry breaking (Graham, Freeman and Emlen 1993; Lowentin 2000, 2006; Palmer 2004, 2008; Palmer and Lowentin 2004). Symmetry breaking is part of the processes affecting the shape of biological organisms. Palmer identifies phylogenic patterns of variance in the evolution of bilateral asymmetric species. Namely, the fact that Fluctuating Asymmetry, i.e., the random left or right prominence, precedes Directional Asymmetry, i.e., the clear, exclusive left or right prominence of bipartite organisms. This pattern of variance on the shape of biological organisms is an effect of external factors on these organisms. Symmetry breaking in the computational procedure of the language faculty may find its origin in the natural processes affecting the evolution of the shape of biological organisms. Seen as a natural process external to the Language Faculty, symmetry breaking may contribute to our understanding of language development.

4. A striking fact in the development of the nominal extended projection in Indo-European languages is that while pre and post nominal positions for a functional category are possible in earlier stages of the languages, only one position is available in later stages. This phenomenon is neither language specific nor category specific, as it can be observed in the development of prepositions in the Indo-European languages, the definite determiner from Old to Modern Romanian, the possessive adjectives from Ancient to Modern Greek and from Latin to the Romance languages. I raise the question of why this is the case.

5. I argue that this phenomenon is the consequence of the Head Initial/Final Constraint, (1), which I propose to be an evolutionary developmental universal.

(1)   *The Head Initial∕Final Constraint* (HI/FC)
        The choice between the initial and the final position for a functional
        head in the same extended projection is eliminated in the evolution of languages.

The HI/FC is an instance of the Directional Asymmetry principle, (2), that may find its source in the biological evolutionary development of bipartite organisms where the following historical evolutionary path is observed: fluctuating asymmetry > directional asymmetry. In the fluctuating asymmetry stage either one or the other side of a bipartite organism can be prominent, whereas in the directional asymmetry stage, only one is.

(2)   *Directional Asymmetry* (DA)
        Language evolutionary development is symmetry breaking.

While there is nothing like language, language remains an object of the natural world, and thus, it is subject to natural processes. Drawing a parallel with functional projections, it is possible to

associate the fluctuating asymmetry stage to the stage where a complement may occur to the right or to the left of a functional head, and the directional asymmetry stage to the stage where only the right or only the left position remains available.

I discuss the prediction of the DA-HI/FC for Indo-European languages, focusing on the order of the complements with respect to heads in the extended nominal domain, and I show that such evolutionary developmental constraint contributes to the reduction of derivational complexity, measured in terms of length of the derivations.

6. The DA-HI/FC expresses a characteristic of languages as they evolve through time. Such universal is not coextensive with Greenberg's (1966) absolute and implicational universals. Current works on language variation aim to derive language universals from more basic properties of the language faculty. The DA-HI/FC is an evolutionary developmental universal whose predictions do not follow directly from cartographic (Cinque 2005), antisymmetric (Kayne 2011), or other configurational constraints (Biberauer, Holmberg & Roberts 2010). However, it is compatible with these constraints.

7. I discuss the case of languages where there is no robust evidence for DA-HI/FC. For example, Turkish is by and large postpositional, as it is the case for other languages, including Finnish, Hindi, Korean, and Hungarian. I raise the question why this is the case. According to Greenberg's universals no. 3 and no. 4, the availability of prepositions or postpositions is related to broader typological properties, (3). SOV languages (Japanese, Mongolian, Basque, Turkish, Korean, a. o.) are postpositional and VSO languages (Welsh, Classical Arabic, Tagalog, a. o.) are prepositional.

(3)   a. Languages with dominant VSO order are always prepositional. (no. 3)
        b. With overwhelmingly greater than chance frequency, languages with normal SOV order are postpositional. (no. 4)

I argue that the absence of prepositions in some languages, and the absence of postpositions in other languages can be derived from the properties of the computational system, given parallel (harmonic) functional projections chains, including verbs (v) and prepositions (P), on the one hand, and differences in the feature values of P, on the other. I also consider the case of languages such as Mandarin Chinese, where prepositions and postpositions are observed through the language evolutionary development (Djamouri, Waltraud and Whitman 2011). I argue that ad-positions did not evolve from different categories, but rather are an instantiation of the path shell with direction and location heads.

8. It is generally assumed that locality conditions, such as Derivation by Phase and the Minimal Search Condition limit computational complexity. Derivational complexity may also be reduced by the effect of evolutionary developmental processes on the generative procedure of the Language Faculty and the DA-HI/HF may find an explanation in the natural development of biological systems.

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