
Concluding Remarks

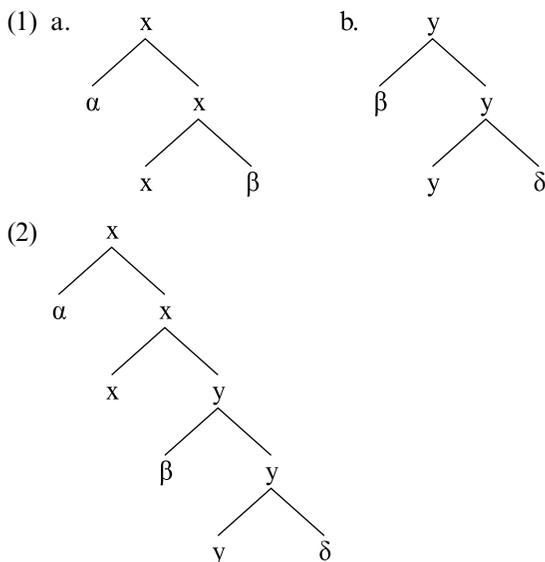
The Arguments in a Nutshell

Given the *Asymmetry Hypothesis*, according to which asymmetry is a core property of the relations of the language faculty, the properties of morphological relations are expected to be asymmetric. The *Strict Asymmetry of Morphology* is a hypothesis that is validated crosslinguistically, as evidenced on the basis of a large variety of languages, including languages from the Romance, Slavic, Finno-Ugric, Turkic, Niger-Congo, and Germanic families. According to Asymmetry Theory, M and S differ with respect to the properties of their primitives: whereas D_M accesses asymmetry from the start, D_S does not have access to the asymmetry of morphology and must generate its own asymmetry. The early asymmetric property of the relations in D_M contrasts with the properties of relations in D_S , which are strictly asymmetric only at a later stage. D_M and D_S differ also with respect to the operations implementing the generic operations of the grammar. Moreover, given the fully parallel architecture of the grammar, morphological domains are derived on a par with syntactic domains and transferred to D_Φ and D_Σ . Interactions between D_M and D_S , as well as between the latter and D_Φ and D_Σ are restricted to isolable domains of computation. The fully parallel model provides a rationale for the existence of shared properties of form and interpretation as well as formal and semantic differences between morphological and syntactic objects.

It is, of course, tempting to treat the parallelism as an isomorphism, and thus identify morphology with syntax (see Embick and Noyer 2001). One problem with this view is the increase of the computational load of the grammar. A single syntactic derivation for both words and phrases requires additional rules to derive word-internal properties in addition to the rules deriving phrasal properties, because syntactic and morphological properties are not coextensive. In some cases, these rules violate the core properties of the operations of the grammar, such as Locality and Strong

binding. If, as I argue, the similarities between morphology and syntax are the result of parallel derivations, there is no increase in computational complexity; on the contrary, the parallel derivations contribute to the efficiency of the language design. The grammar articulates asymmetry in more than one component, each component being an implementation of the generic properties of the grammar. The operations of D_M preserve the asymmetry of the morphological primitives, whereas the operations of D_S build up syntactic asymmetric relations and neutralize points of symmetry as they arise.

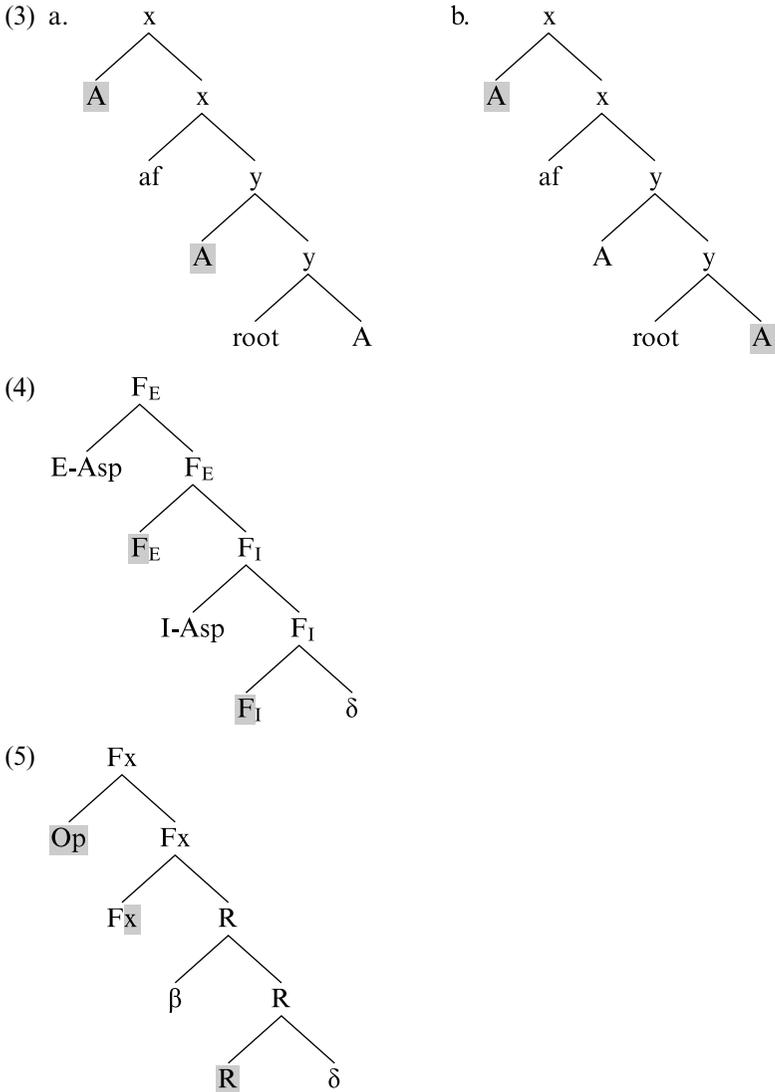
I proposed that the form of a minimal morphological object is the M-Shell. The M-Shell is derived by the application of M-Shift to two minimal trees, substituting one minimal tree for the complement of the other.



The derivation of the M-Shell is determined by Strict Asymmetry—that is, the requirement imposed on every element of an object generated by the grammar to be in an asymmetric relation with another element of the same sort as early as possible. Strict Asymmetry is met at each step of the derivation, because a new affixal head or specifier will sister-contain another element of the same sort generated at an earlier stage. The M-Shell constitutes a morphological domain, given the properties of its internal structure, its strong impenetrability, and its isolability at the interfaces.

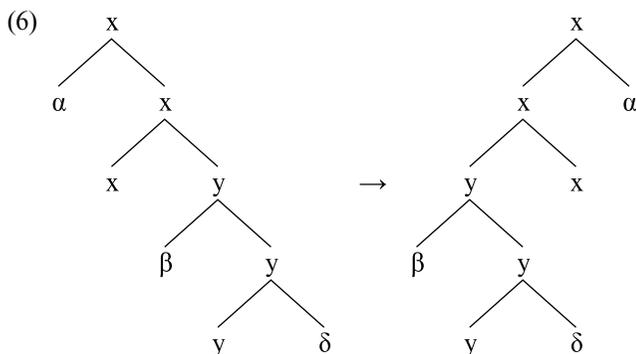
The persistence of asymmetry through D_M is ensured by the properties of the morphological operations, which do not introduce symmetry at any point of a derivation. Instead, each application of M-Shift builds a

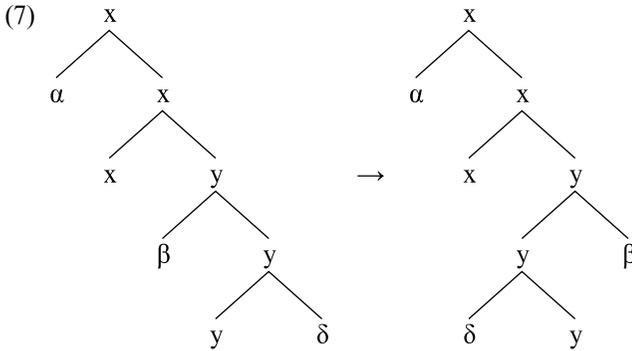
supplementary layer of asymmetric relations. M-Link applies to positions in derived M-Shells and, as is also the case for S-Shift, it applies under Agree, which is an asymmetric relation that holds between active contra-valued features. The M-Shell articulates A, Asp, and Op-variable features, and the different instances of the M-Shell differ minimally with respect to the application of the M-Link operation: A positions only or Asp head positions only or Op-variable-Restrictor only (see (3)–(5)). M-Shift and M-Link ensure the checking of the morphological uninterpretable features.



Because morphology manipulates interpretable semantic features (argument, aspect, and operator-variable features), it is tempting to assume that the derivation of morphological expressions is performed exclusively via the syntax and semantics of a logical language (see Hoeksema 1985). However, this avenue fails to express the configurational asymmetry of morphology. I have shown throughout chapters 5 to 7, on the basis of a variety of languages from the Romance, Slavic, Finno-Ugric, Turkic, Niger-Congo, and Germanic families, that the same asymmetric form, the M-Shell, supports different semantic relations: predicate-argument, aspect, and operator-variable. Distinctiveness holds for all the featural relations in D_M and is a consequence of the properties of the operations of the grammar applying under Agree.

Furthermore, the properties of functional words, including scope-taking affixes, indicate that the scope relations are fixed within the Op-Shells. Strict Scope, along with the inalterability of the Asp-Shell and A-Shell, bring compelling support to the strict asymmetry of morphological relations. The Legibility Condition ensures that optimal interpretation is obtained under asymmetric relations at LF. Moreover, in D_Φ , the image of a projection of D_M is derived, without leaving a copy or a trace. Flip is triggered by the sensorimotor system for tractability considerations. This operation reduces the complexity derived by the grammar at PF and contributes to linearization. Flip applies to minimal trees whose specifier presents different sorts of complexity, depending on whether the operation applies at the outcome of D_M or D_S . M-Flip must apply to an M-Shell whose specifier has no PF-legible features and S-Flip must apply to an Asp-Shell or an Op-Shell only when the specifier is “heavy” (i.e., includes a complement). The complexity seems to be reduced to the property of the initial position, the specifier, of having insufficient or excessive PF structure.





In (6), the top layer of the M-Shell undergoes M-Flip; in (7), the lower layer undergoes the operation. Thus, the ordering of the affixes is derived at PF, and there is no need to stipulate whether an affix is a prefix or a suffix.

The operations of Asymmetry Theory participate in an explanatory account of crosslinguistic variation regarding the linear order of affixes and roots, in derivation and in compound formation, given independent properties of the languages, such as the availability of a tonal system in African languages. Other facts from the Romance languages regarding the position and the legibility of affixes at PF indicate that M-Link plays a role in variation, given independent properties of the languages such as the spell-out of the directional feature of aspect as an independent functional element. In both cases, the asymmetry of morphological relations is preserved in variation. Moreover, in light of the full parallelism of the architecture of the grammar, morphological variation can also be located in the choice of a sort of derivation, D_S or D_M , for a given linguistic object, as is the case for the derivation of compounds in languages such as English and modern Greek, on the one hand, and the Romance languages and the African languages, on the other. English and modern Greek pick out D_M ; French and Yekhee pick out D_S .

The asymmetry of morphology, as part of the Global Economy of grammar, helps explain why language is an optimal solution to the interface legibility conditions.

Asymmetry in a Broader Perspective

According to Asymmetry Theory, the primitives of M include elementary asymmetric relations, and morphological expressions are derived by asymmetry-preserving operations: M manipulates asymmetric relations only. Why should asymmetry be the characteristic property of relations in

D_M as well as of relations in D_S ? In these concluding remarks, I would like to provide a possible answer to this question by relating the role of asymmetry in grammar to Economy.

Economy is part of grammar in terms of principles of optimization. These principles enable the grammar to take the optimal decision at a given choice point. It has been shown that principles of economy or optimality, often identified with “least effort,” play a crucial role in determining the properties of linguistic expressions at both PF and LF. Chomsky (1995) suggests that movement is available as a “last resort” operation, applicable only when necessary. The derivations must be as economical as possible and should contain no superfluous steps.

Economy conditions have been proposed to relate the properties of representations and derivations to interface legibility. For a representation or a derivation to be identified as the optimal solution to the interface legibility conditions, it must qualify as the most economical solution for legibility by the external systems. Economy of derivations ensures that an operation will apply in a derivation only if its output is legible at the interfaces. Fox (2000) argues that QR applies only when there is a scope ambiguity. No sentence with ambiguous scope relations is interpretable at LF. The Inclusiveness Condition (Chomsky 1995) ensures that no new element (e.g., traces, index, and so on) may be introduced in the derivation if not already in the numeration. “Inclusiveness holds of narrow syntax, and each feature is interpreted at the level of LF or associated with phonetic features by the phonological component” (Chomsky 2000b, 118). The Inclusiveness Condition is associated with a division of labor between syntax and phonology. Inclusiveness ensures both Economy of derivations and representations.

The principle of Full Interpretation (Chomsky 1995, 2000b) states that there should be no superfluous symbols in representations. This principle plays an important role at the PF interface because it excludes representations where a symbol has no phonetic interpretation. Full interpretation also applies at the LF interface, imposing the requirement that every symbol of that representation have a language-independent interpretation. Principles of Economy of representation are formulated in a number of works, including Grimshaw 1994, Speas 1994, Bošković 1997, and Williams 2003.

I would like to suggest that economy is a global property of the language design, and that the fully parallel architecture of Asymmetry Theory is a consequence of the Global Economy of grammar. Parallel derivations contribute to the optimality of the language design, because

the core properties of the grammar are used in more than one dimension of the computational space.

In Asymmetry Theory, a small set of primitives are used in the different components, and the operations have specific instantiations in the parallel derivations. This property of the architecture of the grammar is a consequence of the Economy of the grammatical system, making an optimal use of its basic properties. The parallel model reduces the computational complexity of the overall grammatical system. Fewer choice points arise in a parallel model than would arise in a model where the different sorts of grammatical objects, morphological, syntactic, and phonological, would be the outcome of a unique derivational path. Efficiency of derivation and interpretation can be ensured if the morphological and syntactic properties of linguistic expressions are processed in separate planes of the computational space, scope and other semantic relations being interpreted by the conceptual-intentional system, and linear precedence relations being interpreted by the sensorimotor system.

The fact that asymmetric relations are part of the derivations of the grammar irrespective of the nature of the derived objects, be they morphological, syntactic, phonological, or semantic, signals that economy is part of the architecture of the language design. Global Economy does not bear directly on the properties of the derivations or the representations, such as the Inclusiveness Condition and the Full Interpretation Condition; it provides a rationale for their existence.

One effect of the Global Economy is the pervasiveness of one property of relations—that is, asymmetry—through the building blocks of grammar. Asymmetry is part of the definition of the primitives, the operations, and the conditions of the grammar. It is used directly or derived as soon as possible in the derivations. Given the Global Economy of the grammar, it does not come as a surprise that asymmetric relations are determinant in more than one plane of the computational space. Asymmetry is also part of the interface conditions. As proposed in chapter 2, the Legibility Condition states that optimal legibility may only be obtained under asymmetric relations. Whereas Full Interpretation requires no superfluous symbol at the interfaces, the Legibility Condition requires the symbols to be part of asymmetric relations at the interfaces. Asymmetry must play a key role at the interfaces, because the expressions derived by the grammar, $\langle \text{PF}, \text{LF} \rangle$, must be easily tractable by the external systems, which can be viewed as asymmetry-recovering systems. From this perspective, asymmetric relations would provide the perfect property of relations enabling different systems to interface. This too would not be so

surprising, because to be transferred from one derivation to another a grammatical object must constitute an isolable domain of interpretation where strict asymmetry must hold. If asymmetric relations enable the units of the computation to transfer through the different planes of the computational space, this property of relations would also be the perfect property enabling the contact between the expressions derived by the grammar and the external systems.

In fact, if the language faculty did not consist of a restricted set of primitives, operations, and conditions, it would be impossible to explain why language acquisition follows the same stages independently of language or ethnic group—for example, the production of substantive categories precedes the production of functional categories; the production of constituents including minimal asymmetries is followed by the production of constituents including extended asymmetries. The asymmetry of morphology, as an instance of the basic asymmetry of relations, opens a path in the understanding of the properties of the language design.