# On UG and Materialization

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**Abstract**

This essay discusses Universal Grammar (UG) and the materialization of internal and external language (commonly misconceived of as "lexicalization"). It develops a few simple but central ideas. First, the Universal Lexicon (the "lexical" part of UG) contains two elements: an initial root, Root Zero, and an initial functional feature, Feature Zero, identified as the Edge Feature (zero as they are void of content). Second, UG = a Minimal Language Generator, containing a) Merge, b) Root Zero, and c) Feature Zero. Third, both External and Internal Merge are preconditioned by Feature Zero or the Edge Feature (the Generalized Edge Approach). Fourth, the growth of internal language in the individual involves reiterated (formal) Copy & Merge of Root Zero and Feature Zero (the Copy Theory of Language Growth). The essay focuses on the materialization of internal language, but it also contains a brief discussion of externalization and language variation.

## 1. Introduction: The Anti-Lexicalist Hypothesis

This is an exploratory essay, where I develop some simple but basic ideas concerning materialization of language, above all *internal materialization* (contradictory as that term may seem).[1] The outcome is tentative, and, to be frank, it surprised me, even though I should perhaps have seen it coming, in view of the development of minimalist theory over the last decade. In a nutshell, it suggests that UG is void of meaningful items, the functional lexicon of language (Person, Tense, etc.) thus deriving from 3rd factor elements (in the sense of Chomsky 2005).

[1] Materialization is usually thought of as "lexicalization," but that is an unfortunate misconception (a distinction must be drawn between internal materialization and the spelling out of PF-words and PF-idioms).

The ideas pursued here were first presented at a European Science Foundation Exploratory Workshop: *Exploring the roots of linguistic diversity: Biolinguistic perspectives*, Universitat Autònoma de Barcelona, September 20-23, 2010. Many thanks to Cedric Boeckx and the other organizers of this event, and to the audience for lively discussions. I am also grateful to Terje Lohndal, Mike Putnam, and reviewers for helpful remarks. The writing of the essay partly overlapped in time with the writing of Uniformity and diversity: a minimalist perspective (Sigurðsson 2011b), the two essays thus partly overlapping in content as well.

Any model or theory of the language faculty that distinguishes between internal language (I-language) and external language (E-language) has to assume that the two are related by *externalization*. The notions I-language and E-language (see Chomsky 1986: 19ff) have been used in somewhat varying senses. For my present purposes, the only relevant distinction between them is precisely that of externalization. I will thus use "I-language" as a cover term for mind-internal language (as an individual-internal system of "linguistic thought"), using "E-language" as a cover term for any form and occurrence of externalized language (used for communicative and other social means). Pointing out, as Berwick and Chomsky (2011: 37) do, that "[e]xternalization is not a simple task," is an understatement. However, little as we know about externalization, it seems clear that we need to distinguish between at least two types or aspects of it, *materialization* and *localization* of the "material."[2] I will here focus on materialization, putting localization aside.

I pursue the following two questions on UG elements:

(1) What are the elements of UG?
(2) How are the elements of UG materialized?

–where the notion *elements* refers to units or building features, as distinct from relations and processes (Agree, Merge, etc.).[3]

These are no small questions, but they are simple and basic and it is worrisome that linguistics has not been able to develop any commonly agreed upon ways of approaching or tackling them. Doing linguistics is in this respect somewhat similar to doing chemistry without any knowledge or theory of elements.

Suppose that the linguist X boldly answers the question in (1) by saying, "well, we have to assume at least the Chomskyan categories C, T and little v". The answer would undoubtedly make many linguists happy, but why would or should they agree with X on this? Do they have any methods or heuristics enabling them to come to this conclusion or do they agree because they believe X is adopting something said by Chomsky?

The truth of the matter is that we don't know what is "in there," and, worse, we don't have any established methods of acquiring reliable knowledge of it, much as many of us

[2] Notice that localization is not merely about linearization, as for example evidenced by sign languages and by suprasegmental markers in oral languages.

[3] These elements are sometimes referred to as "lexical items" in the minimalist literature, unfortunately so as that notion does not make any sharp distinction between atomic non-composite items and derived composite ones.

would like to. However, we have at least the minimalist way of *reasoning* about this, by exploring the thesis that UG is truly minimal, not only architecturally, but also (and even more plausibly so) "lexically".

Mainstream generativism (Chomsky 1981, 1991, 1995, etc.) has long pursued mixed lexicalist approaches, where syntax operates on both individual features and complex items. In Approaching UG from Below, Chomsky (2007a: 6) thus suggests that "[i]n addition to Merge …, UG must at least provide atomic elements, lexical items, each a structured array of properties (*features*) to which Merge and other operations apply to form expressions."[4] However, it is unclear, from where or how such "structured arrays" would enter UG.[5] If some of the units of UG are structured, they must somehow get structured, raising the question of where and how this structuring takes place. But this is obviously a wrong track, leading to wrong questions and paradoxical assumptions. There can be no structuring of linguistic elements feeding UG. Accordingly, I make the minimal assumptions stated in (4).

(4) UG contains:

a. A computational faculty, FLN, applying Merge without bounds

b. The *Universal Lexicon*, UL, of non-composite atomic elements

In contrast, *adult languages* operate with complex or structured items. Possibly, as internal language gets externalized, thereby getting used for social purposes, Narrow Syntax gradually starts internalizing and operating with acquired complex communication items (words/idioms), in tandem with universal categories. If so, the syntax of adults is a hybrid system, operating with abstract universal features and also with a great number of discrete items of a communication lexicon, the number of and the internal space taken up by such items increasing as the individual matures.

As for UL, on the other hand, I adopt the *Anti-Lexicalist Hypothesis* or the "true lexicalist hypothesis" stated in (5).

[4] For another perspective, much closer to the ideas pursued here, see Chomsky 2008: 139, on the putative correlation between language and arithmetic ("Suppose that a language has the simplest possible lexicon: just one L[exical]I[tem]," etc.). However, while Chomsky assumes that LI comes equipped with the Edge Feature, I argue that the two are combined by Merge (see shortly).

[5] And it is also unclear whether Chomsky is just being non-explicit or actually assuming that there is some kind of UG external "item factory".

(5) The Anti-Lexicalist Hypothesis (or the true lexicalist hypothesis)
UL contains:

a. an initial root, $\sqrt{_0}$ (Root Zero) = *The Initial Zero Root Thesis*

b. an initial functional feature, $F_0$ (Feature Zero) = *The Initial Zero Feature Thesis*

Thus, minimalist reasoning applies not only to the computational but also to the "lexical" component of UG.

## 2. The computational component(s)

Hauser et al. (2002) introduced a distinction between the faculty of language in the narrow and the broad sense, FLN and FLB, respectively, with FLB properly including FLN. In addition to FLN, FLB consists of at least the sensory motor interface, SM, and the conceptual-intentional interface, C-I, sometimes referred to as the (morpho-)phonological and semantic interfaces. FLN, in turn, is truly minimal, comprising "only the core computational mechanisms of recursion as they appear in narrow syntax and the mappings to the interfaces" (Hauser et al. 2002: 1573). I assume that the following correlations hold (where the symbol > reads as "is larger than"):

(6) FLB > Narrow Syntax > UG > FLN

A stronger claim would be that the relation between these systems or notions is that of a proper inclusion ("FLB properly includes Narrow Syntax," etc.). For what I know that might be the correct understanding, but I will not maintain that it is, (6) being sufficiently explicit for my purposes.

Hauser et al. (2002) do not really discuss UG and Narrow Syntax, only mentioning these notions in passing. As a matter of fact, they seem to have two contradictory conceptions of the relation between FLN and Narrow Syntax. For one, as cited above, they "propose … that FLN comprises only the core computational mechanisms of recursion as they appear in narrow syntax and the mappings to the interfaces." This would seem to suggest the understanding in (6) above, where FLN is "smaller than" or a "component of" Narrow Syntax. However, Hauser at al. also assume that "a key component of FLN is a computational system (narrow syntax) that generates internal representations and maps them into the

[interfaces]" (2002: 1571). Here, it would seem that Hauser at al. are assuming that FLN is "bigger than" Narrow Syntax, the latter being "a component of" the former.

Chomsky (2005: 6) distinguishes between "three factors that enter into the growth of language in the individual:"

1. Genetic endowment, apparently nearly uniform for the species, which interprets part of the environment as linguistic experience …
2. Experience, which leads to variation, within a fairly narrow range, …
3. Principles not specific to the faculty of language.

Chomsky does not define or discuss these notions in relation to the notions of Hauser et al. (2002). My understanding is that the 1st factor is roughly tantamount to FLN (perhaps minus interpretation of "part of the environment as linguistic experience"), whereas FLB intersects with the 3rd factor.[6]

Much of what was conceived of as principles of language in the Principles and Parameters approach of the 1980s is now seen as 3rd factor phenomena, basically non-linguistic or at least not specifically linguistic. In particular, the interfaces as well as general principles of structural architecture and computational efficiency are subcomponents of the 3rd factor. While the 1st factor is taken to be specific "for language, the topic of UG," the 3rd factor is "not specific to … [language], and may be organism-independent" (Chomsky 2008: 133), that is, non-species specific. Computational limitations, such as minimality and the Phase Impenetrability Condition, are thus subcategories of the 3rd factor, and that would seem to apply to binary branching as well (Chomsky 2005: 16). It follows that Narrow Syntax comprises or obeys some 3rd factor components, hence the understanding in (6) above that Narrow Syntax is "larger than" FLN.[7] The received generativist understanding of UG, in turn, is that it is specific to language and to the species.[8] If so, it should not contain any (language

[6] As FLB properly includes FLN and as the latter is not part of the 3rd factor in the relevant sense, it follows that FLB is not properly contained in the 3rd factor.

[7] If so, however, Narrow Syntax is not a pure I-language notion, a conclusion that would seem to contradict Chomsky's understanding that Narrow Syntax only feeds mapping to the semantic interface (1981: 3, 15). The notion of Narrow Syntax emerged in an era when there was no sharp drawing line between I- and E-language, hence the dilemma. For a sharper distinction between I-syntax and "E-syntax", see Sigurðsson 2011b.

[8] However, this widely adopted assumption is not innocent or self-evident. Other cognitive systems, including arithmetic and music (see Katz and Pesetsky 2011) share some kind of Merge with language. The question of

external or language nonspecific) 3rd factor components, meaning that it should contain FLN but not Narrow Syntax as a whole.

The terms Narrow Syntax, UG, FLN, the 1st factor, and even the cover term I-language are commonly used vaguely and in more or less the same sense, which is obviously rather unfortunate. I thus felt it was necessary to briefly sort out how these notions relate to each other, at least in my understanding. However, regardless of how we conceive of these notions and of the computational component(s) of language, the unanswered and "highly undiscussed" questions in (1) and (2) arise under all approaches. Having introduced the notion of Universal Lexicon, UL, we can restate these questions as in (7):

(7) a. What are the elements of UL?
b. How are they materialized in language?

In spite of being truly basic, these questions are not easy to pursue. One reason for that is that we need to distinguish between internal (I-language) and external (E-language) materialization. As early materialization in the language growth process is mind-internal (see section 3), typological observations and other traditional linguistic approaches and methods have no clear bearing on it.[9]

## 3. The Initial Zero Root Thesis

Reconsider the Anti-Lexicalist Hypothesis, repeated here.

(5) *The Anti-Lexicalist Hypothesis* (or the true lexicalist hypothesis)
UL contains:
a. an initial root, $\sqrt{_0}$ (Root Zero) = *The Initial Zero Root Thesis*
b. an initial functional feature, $F_0$ (Feature Zero) = *The Initial Zero Feature Thesis*

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whether it is the same kind of Merge hinges on (at least the question of) whether the Edge Feature, preconditioning linguistic Merge (see shortly), is specific to language.

[9] "Universals" in the typological or Greenbergian sense are obviously quite distinct from UG (much as substances are distinct from atoms). Making observation about statistics and surface patterns can of course be interesting or amusing, but it is a different thing to carefully demonstrate that there is some deeper sense to the observed patterns.

Following much recent work (Marantz 1997, Arad 2005, etc.), I assume that basic parts of speech, such as nouns and verbs, are formed by merger of functional features with a root, √.

According to the *Initial Zero Root Thesis* in (5a), UG provides the infant with a single initial root, referred to as *Root Zero*, $\sqrt{}_0$, as it has no content. Figuratively speaking, it is a cell that awaits being (more or less) arbitrarily filled with some conceptual content, say {DAD}.[10] As soon as $\sqrt{}_0$ has been filled with some content, yielding an *internal lexical root*, Root One or $\sqrt{}_1$, in some internal language, $L_x$, the language faculty creates a copy, making $\sqrt{}_0$ available anew, this new copy awaiting to get arbitrarily filled with some content, say {MOM}, yielding $\sqrt{}_2$ in $L_x$, and so on.[11] Notice the resemblance with the Copy Theory of Movement, and, in a way, with prokaryotic fission, suggesting that the growth of syntax in the individual is tightly related to the growth of the individual's internal lexicon (to be discussed shortly). Call this lexical growth *Internal Lexical Merge*.[12]

Two further aspects need to be clarified here. First, I say *internal lexicon*, I-lexicon, as the initial lexicon is internal to the individual, the development of an *external lexicon*, E-lexicon, for the purpose of communication being a later and a separate process. The growth of the initial internal lexicon is independent of its externalization, whereas the later external lexicon is obviously dependent on the internal lexicon.[13] The idea that there is a distinction to be drawn between the two might at first sight seem odd (like other ideas we are not used to), but it is simple and natural: The language faculty carves out a mind-internal linguistic object, a root, before the externalization component can put a label or a "name" on it.[14]

[10] Small case capitals indicate that the elements in question are concepts (and not words or morphemes), and the curly brackets indicate that they are silent, that is, have not been spelled out or realized as words/morphemes.

[11] Alternatively, root cell copying is free (as copying of Feature Zero).

[12] The present understanding suggests that Internal Merge (movement) is actually "more basic" than External Merge, fully integrated in the language faculty (see the discussion in Chomsky 2008: 140–141).

The resemblance of Internal Lexical Merge with syntactic movement might indicate that the internal lexicon is built and stored like a syntactic tree, where a newly carved root is stored at the edge of the storage tree and where the zero root cell is subsequently adjoined to the tree, awaiting to be recopied.

[13] The external lexicon, containing audible, visible or tactile signs and signals, is referred to as the Vocabulary in Distributed Morphology, DM (see Harley and Noyer 1999), whereas DM does not assume any (separate) internal lexicon.

[14] That is, early internal language growth is "nativistic." In contrast, lexical and structural expansion in later learning of external language, including second language learning, evidently involves internalization.

Second, by saying that Root Zero is more or less *arbitrarily* filled with some conceptual content, I mean that the content is largely arbitrary in relation to the external world.[15] The ontological and epistemological status of the content is entirely irrelevant from a linguistic point of view, that is, humans are capable of thinking and talking about concepts regardless of their putative reference to objects in the real world. The examples are countless and completely obvious: *Paradise*, *Hell*, *alpha*, *elf*, *ghost*, *angel*, *Atlantis*, *Twin Earth*, *Martian*, *Star Wars*, *Artoo*, *square root*, *Sally*, and so on (*Sally* could be a cat or a dog, a boat or a car, the girl (or the grandpa) next door, an imaginary person in a story, a hurricane, or whatever).[16] We can obviously have long discussions of a concept without ever having had any external experience of it and such discussions typically seem rational to ourselves, even though they may be completely absurd from the point of view of those who do not share our beliefs (religious and political debates are just two examples). Notice that this is not to say that words *cannot* refer to objects in the external world, that is, I am not claiming that semantic externalism (Putnam 1975 and related work) makes no sense (although it arguably makes more sense as a theory of human conception of the world than as a theory of language). However, it is to say that concepts (and words) need not have any mind-external reference, and it is also to say that even for those items that do have some mind-external reference or correlative, like, say, *house*, the correlative correlates to just a part of their meaning (Chomsky 2007b, 2010, Berwick and Chomsky 2011), and the reference (as well as the meaning) is in fact also relative to the individual that happens to be using the item (in speech/writing or thinking/interpretation). So, a person called Mary could say to me "This house is very green" and I could easily agree with her and we could have a long and a seemingly meaningful and rewarding discussion about the greenness of the house without us meaning the same house or the same kind of greenness–a common everyday experience, even in long marriages. Chomsky's famous example *Colorless green ideas sleep furiously* illustrates the same point (and also further points, which I will not address here).

Notice in this connection that miscommunication and misunderstanding are not the same as absent communication and no understanding, that is, miscommunication can be a perfectly

[15] This is a somewhat imprecise formulation, as the content is not socially arbitrary.

[16] A question raised at the Barcelona workshop was how to understand the fact that children commonly use roots/words in a non-target sense, for instance *cat* meaning both "cat" and "dog." Possibly, the child knows the meaning of *cat*, simply using the term for other animals in lack of specific expressions (E-lexemes) for those, but there are more possibilities to consider. However, I am strictly limiting my present discussion to *internal* roots–where the problem is not observable.

functional linguistic act (as evidenced by various kinds of language use). And even if there is no miscommunication and Mary and I happen to be talking about exactly the same house and precisely the same kind of greenness (given that possibility), both *house* and *green* have much broader meanings than those we can possibly have in mind in any given clause or situation. When I say "I painted the house green," I mean the exterior of the house, not its interior (Chomsky 2007b), but when I say "I bought the house new," I mean both the exterior and the interior. So, when Mary and I talk about "the house" we can of course be referring to the "same object in the external world" (assuming that that notion makes at least some sense), but that tells us almost nothing about the general meaning of the concept {HOUSE}or of the word *house*.[17]

So, the content the child puts into Root Zero (and its copies) may be completely arbitrary in relation to the external world. That raises the question of where the content comes from. Without discussion, I assume that it is based on non-linguistic knowledge, both world knowledge drawn from experience and inherent (biologically preconditioned) conceptual knowledge or representations. Given the Initial Zero Root Thesis, carving items of the internal lexicon on the basis of world knowledge is unproblematic (which would seem to be essentially the correct intuition), and the claim that all concepts are primitives or atoms in the sense of Fodor (e.g., 1970, 1998, see also Fodor and Lepore 1998) becomes intuitively more appealing than commonly assumed, provided that we understand Fodor's "concept" notion as tantamount to our "internal lexical root". Notice that "concepts" in some non-linguistic sense may be complex even though internal roots are atomic units in syntax. Thus, the event described by the verb *drink* may very well be decomposed as, say, "an event where some liquid thing passes along a path into a place called mouth" (see Jackendoff 1990: 80), but that is obviously irrelevant in syntax–which is not to say that it is uninteresting.[18]

[17] In fact, it can be argued (without necessarily subscribing to relativism) that any NP has infinitely many readings, but I put this aside here.

[18] Another tantalizing issue is that morphologically complex E-words, say *helicopter* or *government*, correspond to or express atomic I-roots. Morphological derivation is an E-language "shortcut method" (making PF-economic use of familiar morphological units) to build new "communication items" (words, idioms), but it does not have any one-to-one correlation to internal language, that is, there is no semantic compositionality of for example *govern* and *-ment* in *government* (as suggested by the simple fact that the English word *government* translates as non-derived words in some other languages). The atomic I-root {GOVERNMENT} is conceptually related to the atomic I-root {GOVERN}, but that is not a linguistic fact. Similarly, "pairs" like {KILL} and {DIE}, {DOG} and {ANIMAL}, etc., are conceptually related without that being a linguistic or a syntactic fact.

## 4. The growth of internal language in the individual

Now, consider the growth of internal language in the individual. The initial stage involves the carving out of a root or roots. The second stage provides a root or roots with syntactic "glue" enabling them to merge. This "glue" is referred to as the Edge Feature, EF, in recent minimalist work. Chomsky (2008: 139) takes it to be a feature of lexical items – "and optimally, only of" lexical items, however only considering the EF of C and v*, assuming that EF may act as a probe and trigger movement or Internal Merge, thereby replacing the EPP feature in earlier approaches (for example Chomsky 2001). Contending that EPP (the Extended Projection Principle) is an epiphenomenon that should not be given any primitive or axiomatic status (Sigurðsson 2010b), I explore a related but a slightly different approach, where *both* External and Internal Merge are preconditioned by EF, and where EF comes for free.[19] Call this the *Generalized Edge Approach*.

It might seem possible that the first three stages in the growth of internal language simply involve: 1) root carving, yielding $\sqrt{}_1$, $\sqrt{}_2$ …; 2) item formation by merger of EF and $\sqrt{}$; and 3) symmetric merger of items. This is sketched in (8) (here, the curly brackets denote a set).

| | | | | |
|---|---|---|---|---|
| (8) | a. | Stage 1 | $\sqrt{}_1$, $\sqrt{}_2$ … | (root carving) |
| | b. | Stage 2 | $[_I$ EF $\sqrt{}]$ … | (I(tem)-formation) |
| | c. | Stage 3 | $\{I_x, I_y\}$ | (symmetric I-merger) |

For reasons to be immediately explicated, however, I contend that symmetric Merge is categorically impossible, claiming that every instance of Merge is with an Edge Feature. I thus replace (8) with (9).

| | | | | |
|---|---|---|---|---|
| (9) | a. | Stage 1 | $\sqrt{}_1$, $\sqrt{}_2$ … | (root carving) |
| | b. | Stage 2 | $[_I$ EF $\sqrt{}]$ … | (I-formation, by free EF merger) |
| | c. | Stage 3 | {EF, I} | (I-extension, by free EF merger) |

[19] Notice that the present understanding suggests that probing may not be confined to (simple) C and v* (which, in my view, is not necessarily tantamount to saying that CP and v*P do not have a special status as phases). Alternatively, probing of the subfeatures of C and v* is "assembled", (complex) C and v* thus being "multiple" probes. I put this issue aside here.

d. Stage 4 {X, [EF I]} (item/structure merger)

That is, much as a root has to merge with an Edge Feature to build an item, an item has to merge with an additional Edge Feature to build a larger structure (by merging with another item or with a more complex structure). Similarly, the outcome of Stage 4 can merge with yet another item or structure, Z, given that it has first merged with additional Edge Feature, yielding {Z, [EF $I_x$ [EF $I_y$]]}, see further shortly. We may refer to this as *Edge Feature Iteration*.

Suppose now that the Edge Feature actually is the zero functional feature, $F_0$, postulated by the *Initial Zero Feature Thesis* in (5b). Suppose also that all atomic functional features, call them *F-atoms*, are, formally, copies of Feature Zero, much as all lexical roots are copies of Root Zero. Edge Feature Iteration can then be understood as involving copying and raising of $F_0$, any new copy of $F_0$ being raised to the edge of the structure, thereby enabling recursive Merge. That is, the fundamental recursion property of language boils down to Edge Feature Iteration.[20]

Edge Feature Iteration resolves the recalcitrant *symmetry problem* discussed by Moro (2000, 2008) and Chomsky (2010). Moro claims that symmetric structures, such as the one in (8c), are unstable and cannot be properly labeled, their instability being resolved by one of their members "leaving" or "moving out," as it were, yielding an asymmetric labeled structure that can function as input to further computation. Call this *Moro's Generalization*. Adopting it, Chomsky (2010) suggests that unlabelled structures are uninterpretable at the C-I interface.

I take it that the insight behind the generalization is basically on the right track, but there are slight inconsistencies in Moro's solution. Discussing the symmetry problem with respect to maximal categories, Moro contends (2008: 1f):

> Labels are … derived computationally, via inspection within the search space of a head. When two maximal projections are Merged (either IM or EM), the resulting {XP, YP} can be either an adjunct structure – where either XP asymmetrically projects turning the other into a specifier–or an unlabelled syntactic object where none projects. If this is the case, such as for copular sentences, it is reasonable to assume that the configuration crashes because the search space for any head H that merges with it is ambiguous.
>
> On the other hand, if either XP or YP is targeted by H and then raised (yielding, for example: {YP, {H, {XP, ~~YP~~}}}), the derivation can proceed, because the computational

[20] If so, it is a reasonable conjecture that the evolutionary introduction of $F_0$ "created language."

mechanism has overcome the problem of labeling: YP is no longer available for inspection to H - it being a discontinuous constituent - and the label can be properly assigned.

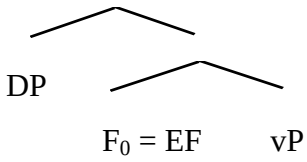
However, the derivation Moro seems to have in mind is countercyclic, as sketched in (10):

(10) a. {XP, YP} (symmetric merger of XP and YP)
b. {H {XP, YP}} (head merger)
c. {H {XP, YP}} (unsuccessful labeling / YP targeted by H)
d. {YP, {H, {XP, ~~YP~~}}} (movement of YP)
e. {YP, {H, {**XP** XP, ~~YP~~}}} (successful labeling)

That is, labeling "via inspection within the search space of a head" is given a second (backtracking countercyclic) chance, after YP-raising out of the symmetric structure.

As symmetric merger, of for instance a subject DP and a vP, is categorically precluded under the Generalized Edge Approach, the symmetry problem dissolves (putting labeling aside). Either DP or vP has to serve as a host and merge with $F_0$, as illustrated for a hosting vP in (11).

(11)

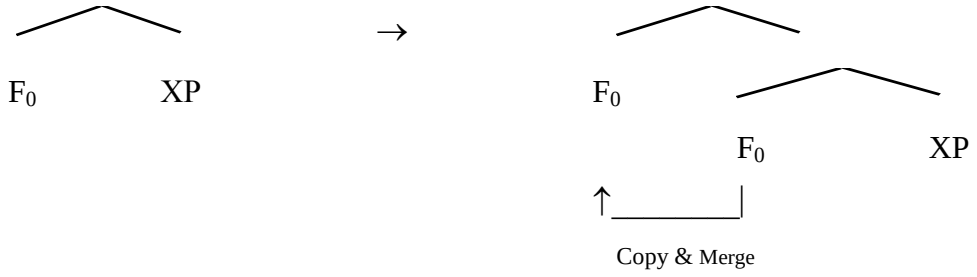



The structure in (11) accords with the traditional assumption that the subject DP is a "specifier" of vP. Nothing in the approach, so far, blocks the reverse relation, where vP is a "specifier" of DP. It is unclear how or even whether this should be blocked (cf. the discussion in Chomsky 2010).[21]

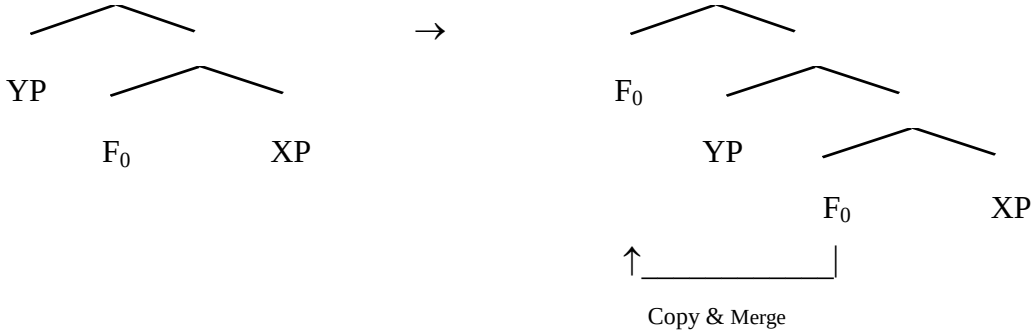
Two further instances of Edge Feature Iteration are sketched in (12) and (13).

[21] Certain types of nominalizations might in fact involve vP "specifiers" of D or DP, but I put the issue aside.

(12) a. b.




(13) a. b.




The structures in (12b) and (13b), in turn, have the option of either merging with yet another Edge Feature (yielding complex heads, see Sigurðsson 2010b) or with a larger structure. In the latter case, the computation either comes to an end or proceeds by repeated Edge Feature Iteration.

Another welcome result of the Generalized Edge Approach and of Edge Feature Iteration is that adjunct stacking (multiple specifiers) is precluded. Whenever we seemingly have multiple specifiers they are separated by silent functional categories, that is, a computation that takes structures like (11) and (13a) as input can only proceed by Edge Feature Iteration. In case it does not proceed, *Stop* applies.[22]

(14) Stop:

If a structure lacks EF ($F_0$), the computation comes to an end, yielding an expression that survives without further computation.

[22] That is, Stop is a general phenomenon (and not confined to interjections, as suggested in Chomsky 2008:139). It follows that EPP is nonexistent (which is of course not to say that feature-driven movements to various types of edges ("EPP effects") are nonexistent).

Given the Anti-Lexicalist Hypothesis, UG is a *Minimal Language Generator*, as stated in (15).[23]

(15) UG = a Minimal Language Generator, MLG, consisting of:
  a. Merge (Internal/External)
  b. The Universal lexicon, UL, comprising:
    b1. Root Zero
    b2. Feature Zero (the Edge Feature)

Accordingly, language growth must involve "propagation" of roots and features. Assuming that internal language growth *only* involves root and feature propagation, I adopt the *Copy Theory of Language Growth*, stated in (16).

(16) The Copy Theory of Language Growth:
  The growth of internal language involves reiterated Copy & Merge of Root Zero and Feature Zero.

## 5. On uniformity, variation, and the Externalization Problem

Much as root copying, Edge Feature or Feature Zero copying is formal, that is, what is copied is a structural entity, a "structural atom," as it were. And much as Root Zero has no content, Feature Zero is void of linguistic content. Whenever it is formally copied, the new copy may be filled with some conceptual content, yielding an F-atom, $F_x$, in some internal language, $L_x$.

A theory of possible and impossible F-atom content is called for under any approach to language, including the present one. The issues are poorly understood, if at all, and I will not try to sort them out in any detail. However, assuming that basic categories like Person, Number, Tense, etc., represent or at least reflect F-atoms, I hypothesize that F-atoms are limited in number, innate (i.e., biological), and universal.[24] Suppose, then, that there is no I-

[23] Notice that "not being part of UG" does not imply "nonuniversal" (a common misconception). That is, some features of language may well be universal without being part of UG.

[24] I can see no good reasons to assume that this does not or should not include categories that are only sporadically reflected in external languages (such as I-language F-atoms that are reflected or represented by honorific and other social markers).

language selection of F-atoms, *L(anguage)-uniformity* applying (notwithstanding frequent claims to the opposite, see for example Ritter and Wiltschko 2009).

(17) L-uniformity:[25]

Any normal human, hence any human language, $L_x$, has access to any F-atom, $F_y$, regardless of whether or how $F_y$ is expressed in (the externalized form of) $L_x$

L-uniformity may seem to make strong claims, but it is in full accord with minimalist assumptions. Alternative approaches would be more complex and costly, requiring non-trivial empirical and theoretical underpinnings.[26] However, regardless of whether L-uniformity applies, F-atoms are *not* narrowly linguistic under the Minimal Language Generator approach to UG, that is, they are not stored in or "given by" UG, instead being derived from 3rd factor entities. This is the surprising outcome mentioned at the beginning of this essay: UG does not contain any meaningful elements, such as Tense.

It is commonly assumed that there is a relatively straightforward (basically one-to-one) correlation between syntactic categories and their PF exponents, for example such that English *-ed* directly spells out (the +PAST value of) the clausal T head. However, nothing is as it seems. As is evident from the extensive literature on tense, from at least Reichenbach 1947 to the present day, overt tense markers do not spell out single syntactic objects, such as a putative $T_{+PAST}$, instead representing relations between event time, reference time, and speech time, that is, $T_E$, $T_R$ (or simply T), and $T_S$ (see Sigurðsson 2004b, 2009a,b, Sigurðsson 2010a,b, Sigurðsson and Maling 2011). So, when I now say *I had already planted three trees*, I am saying that the time of the planting event ($T_E$) preceded some past reference time ($T_R$), which, in turn, preceded the present moment of utterance ($T_S$). That is, there is a double matching relation between the three T elements or "heads" in the clause. First, $T_E$ in the v-domain gets valued in relation to $T_R$ in the T-domain, yielding a non-finite temporal relation

[25] See Sigurðsson 2004a. For a related conception, see the Strong Uniformity Thesis in Boeckx 2011, but notice that Boeckx' formulation focuses on "principles of narrow syntax" rather than on putative selection vs. non-selection of F-atoms. L-uniformity is compatible with but not entailed by Boeckx' formulation.

[26] Any theory that claims that languages select different F-atoms faces a number of severe problems, such as explaining how and why the selection would take place and developing some account of the fact that all human languages, including all known sign languages, are nevertheless mutually translatable (maybe not always perfectly, but in sharp contrast to artificial "languages"). These are serious challenges that cannot be simply trivialized or swept away (see the discussion in Sigurðsson 2004a).

expressed by the participle *planted*; denote this relation as $T_E/T_R$ (where the slash indicates a matching/valuing relation). Second, this relation matches $T_S$ in the C-domain of the clause, yielding a secondary (finite) tense relation, $T_S/(T_E/T_R)$.

Other central categories enter similar matching/valuing relations, such that an element in the v-domain of the clause matches (and gets valued in relation to) an element in the T-domain, the outcome of this low matching relation in turn entering a higher matching/valuing relation with an element in the C-domain.[27] Consider this for Person. A value like 1st person is quite obviously not an exponent of a single element. Thus, in a clause like *I planted three trees*, the 1st person expresses the fact that the PLANTER participant of the PLANTING event is a "person" (rather than, say, an instrument) that happens to be the same actor as the individual who expresses the clause. Again, two matching/valuing relations are involved: first, a low one between an event participant ($NP_\alpha$) in the v-domain and a Person head (Pn) in the T-domain,[28] and, second, a higher one between the outcome ($NP_{+Pn}$) of this low relation and logophoric (speaker/hearer) features in the C-domain, referred to as the logophoric agent ($\Lambda_A$) and the logophoric patient ($\Lambda_P$) in Sigurðsson 2004b and subsequent work. While the lower relation between $NP_\alpha$ and Pn yields $NP_{+/-Pn}$, the higher relation values $NP_{+Pn}$ as including the speaker, the hearer, or neither, and it is this higher matching relation that yields the person values of the NP ($[+\Lambda_A, -\Lambda_P]$ = 1st person, and so on).[29]

These and related generalizations can be captured in a cartographic approach, along the lines sketched in the (18).[30]

(18) $[_{CP} \ldots \Lambda_A \ldots \Lambda_P \ldots T_S \ldots [_{TP} \ldots Pn \ldots T_R \ldots [_{vP} \ldots T_E \ldots NP_\alpha \ldots]]]$

[27] In other words, the vP phase and the CP phase get "grammatically linked" by entering matching relations with elements of the T-domain.

[28] NPs enter the derivation as ϕ-variables, as evidenced by crosslinguistically robust facts (such as indexical shifting and fake indexicals).

[29] "Nonpersonal" NPs only match Pn negatively (yielding $NP_{-Pn}$), not actively matching the logophoric C-features (thus getting valued as 3rd person by default rather than by computation).

[30] Needless to say, (18) is a simplification, showing only a few of the features of the clausal "spine." CP, TP, and vP might alternatively be designated as $T_SP$, $T_RP$ and $T_EP$, if one likes and if one believes that T heads are more central than other clausal heads. As there is no clear understanding of labeling (cf. Chomsky 2010), I refrain from taking a stand on this–it might be a non-issue. Overt exponents of the heads in (18) commonly get bundled up in PF, an issue I set aside here (but see Sigurðsson and Holmberg 2008, Sigurðsson 2010b, 2011a).

To repeat: Much as $T_E$ matches $T_R$, $T_E/T_R$ in turn matching $T_S$ (yielding finite tense), $NP_\alpha$ matches Pn (as +/–Pn), $NP_{+Pn}$ in turn matching $\Lambda_A$ and $\Lambda_P$ (yielding the actual person values).

On the standard minimalist view, adopted here, that the syntactic computation feeds the interfaces, the features in (18) are Narrow Syntax elements. That is, the computation of Person, Tense and other central grammatical categories is syntactic (feeding pragmatics and not vice versa). However, as we have seen, Narrow Syntax features are not stored in or provided by UL, even though they are universal (as I-language F-atoms) under the present approach.[31]

Perhaps, I-language partly "fossilizes" as the individual matures, leading to gradual "cell-death" of some of the initially accessible F-atoms, thereby yielding some I-language variation in adults. This is at least a conceivable scenario, but, regardless of the nature of I-language maturation (and deterioration), it is clear that F-atoms are not expressed or interpreted in the same fashion across different E-languages. That is, F-atom externalization (as externalization in general) leads to E-language variation, some of the variation arising as different E-languages are PF-silent about different syntactically active F-atoms (Sigurðsson 2004a). One of many intriguing questions that arise is whether this variation can be meaningfully analyzed as being guided or decided by non-trivial parameters (as distinct from trivial descriptive "points of variation").

On the Minimal Language Generator approach to UG, there can be no UG-anchored parameters (*pace* much valuable work on parameter theory).[32] In contrast, externalization parameters or *E-parameters* are not obviously incompatible with the ideas pursued here. If such parameters can be plausibly argued to exist, the question arises whether they are 1) specific to distinct modes of externalization (audible, visible, tactile), 2) mode-nonspecific, or 3) variably mode-specific and mode-nonspecific (cf. the discussion in Sandler and Lillo-Martin 2006, Hohenberger 2007). In any event, the challenge of both tactile and visible sign languages must be taken very seriously if any deeper understanding of externalization and language variation is to emerge.

[31] Recall that "being universal" does not entail "belongs to UG."

[32] Plausibly, underspecification gives rise to variation (see Biberauer et al. 2009), much as crossroads in a landscape. That is, the acquirer or the "traveler" cannot get any further without opting for one road or the other. However, it is advisable to sharply distinguish between the non-trivial notion of *parameter* and general 3rd factor underspecification. Parameters were supposed to solve the "logical problem of acquisition" and account for (and make predictions about) limits to language variation. Underspecification is compatible with both acquisition and limited variation, but it does not make any specific claims or predictions about either one.

Transfer from syntax to PF (Perceptible Form) and subsequent spell-out is a much more opaque process than commonly assumed. As discussed above, both Tense and Person express *relations* between syntactic elements rather than discrete syntactic units, and it has been argued that this applies to other grammatical categories as well, including Number, Mood, and Case (Sigurðsson 2009a,b, 2011a,b, and related work). If morphology in general expresses or interprets relations between elements in distinct phases rather than single phase-internal units, then it cannot be the case that PF directly lexicalizes either terminal nodes (as in Distributed Morphology), or larger structures (as in nanosyntax, see Fábregas 2009, Starke 2011). The late lexical insertion approach of Distributed Morphology was an important step forward, but, nevertheless, the question of how syntactic structures get reinterpreted as phonetic expressions or as visual or tactile shape formations remains a largely unresolved mystery; call it the *Externalization Problem*. In particular, E-language does *not* observe Montague type compositionality. It is unclear whether I-language observes "computational compositionality" (in some meaningful sense), but, even if it perhaps does, it could not be the case that such compositionality transfers to E-language. Processing E-language is possible because language users interpret or decode E-language in relation to their I-language (and not because of any exact mappings between I- and E-language). That is, fluent speakers/hearers understand E-language as if it was their own I-language, hence E-language does not "preserve" I-language properties–it is in fact plausibly precluded from doing so (Sigurðsson 2004a, 2009a,b).[33] Meaning does not reside in sounds or signs, it resides in minds.

Understanding language externalization, including E-language materialization, is one of the most urgent and challenging tasks of scientific inquiry, but central research questions remain murky and even unasked. In this essay, I have explored the idea that E-language materialization is preceded by I-language materialization, the latter taking 3rd factor elements as input, UG being incapable of providing language with meaningful items as it does not have any.

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[33] "Rather, communication is a more-or-less affair, in which the speaker produces external events and hearers seek to match them as best they can to their own internal resources" (Berwick and Chomsky 2011). Accordingly, it is not surprising that there is "a kind of law of the study of language that says that if anything can be misunderstood it will be misunderstood" (Chomsky 2010), and this "law" is evidently not limited to the study of language. To internalize another person's ideas via her or his E-language is not a simple task.

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