Universality and variation in language
The fundamental issues

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This article discusses language universality and language variation, and suggests that there is no feature variation in initial syntax, featural variation arising by metamorphosis under transfer from syntax to PF-morphology. In particular, it explores the Zero Hypothesis, stating that Universal Grammar, UG, only provides two building elements, Root Zero and Edge Feature Zero, zero, as they are purely structural/formal elements with no semantic content in UG. Their potential content is provided by the Concept Mine, a mind-internal but language-external department. UG and narrow syntax has access to the Concept Mine, and this Syntax-Concept Access is unique to humans, a prerequisite for the evolution of language (section 1). A related idea (also in section 1) is coined the Generalized Edge Feature Approach, GEFA. It states that Merge always involves at least one edge feature, which precludes symmetric structures and enables Simplest Merge (no Pair-Merge, no Hilbert epsilon operator). The article advocates that there is no syntactic feature selection (section 2), all syntactic features being universally accessible in the Concept Mine, via Root Zero and Edge Feature Zero. In contrast, there is feature selection in PF (including morphology), yielding variation (section 3), Gender being a clear example (section 4). However, there is a widely neglected syntax-to-PF-morphology metamorphosis (section 5), such that morphological features like [past] are distinct from albeit related to syntactic features like Speech Time. Parameters operate on selected PF features, and not on purely syntactic features, so parameter setting is plausibly closely tied to the syntax-to-PF-morphology metamorphosis (the concluding section 6). It is suggested that parameters are on the externalization side of language, part of or related to the sensory-motor system, facilitating motoric learning in language acquisition.

Keywords: Root Zero, Concept Mine, Simplest Merge, Tense, Gender, edge features, edge computation, parameters, language metamorphosis

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1 The Zero Hypothesis and GEFA

Language variation and language universality cannot be discussed separately; they must be discussed in relation to each other. This article aims to do so. I start out be presenting my view on universality in sections 1 and 2, discussing variation in sections 3–5, concluding in section 6. My ambition is to keep the discussion as accessible as possible, so this is a very general paper; there is no shortage of technical linguistic works. This paper is on fundamental conceptual issues that regard universality and variation in language. I focus on syntactic versus morphological features and their relationship, leaving hierarchical and ordering issues out of the discussion.[1]

The language faculty is a biological capacity, and all humans share its initial stage, Universal Grammar (UG). This capacity is the common denominator of all human languages, including sign languages, visual or tactile. It stands to reason that this common denominator must be minimal. It cannot, in particular, contain any words or expressions in the regular sense. Consider the English expressions *mother* and *grandmother* and their Icelandic Sign Language correspondences (roughly) "one finger across forehead", meaning 'mother', and "two fingers across forehead", meaning 'grandmother'. These are complex expressions, not atomic ones. This may not be obvious for English *mother*, but it is clear for the composite *grandmother*, and still clearer for the Icelandic Sign Language expressions. "A finger across forehead" mimics a wrinkle of worry or concern in a mother's forehead and adding a second finger in the expression for 'grandmother' indicates second generation. Similarly, the expression for father is (roughly) "one finger from forehead down the right chin", while 'grandfather' is expressed by the same movement with two fingers.[2] Surely, none of these expressions are part of or directly provided by UG.

Questions arise. First, do these words express universal concepts – is for example MOTHER[3] a universal, innate concept, hiding behind a wrinkle of concern in Icelandic Sign Language? There is no self-evident answer to that question, but I assume that it has a positive answer: Yes, MOTHER is a universal concept, and, yes, it is innate, biologically given, not learned by experience. It is arguably a primitive, and not composed of other concepts, such as FEMALE plus PARENT, as suggested

[1] These have been extensively discussed by Richard Kayne, Anders Holmberg, and many others, see for example Sheehan et. al 2017 and the references there.

[2] My apologies for how incomplete these descriptions are. The corresponding expressions in, for example, Swedish Sign Language, are different, but, interestingly, they share the doubling feature, indicating second generation, with the Icelandic Sign Language expressions.

[3] I use small capitals for concepts and conceptual categories, regular roman within parentheses for morphological features.

by expressions like *mother nature*, *mother of all nations*, and so on. The question of compositionality may be discussed for individual concepts, for example MOTHER, but there can be no question that there are some basic, underived concepts. There are also derived concepts, such as GREAT-GRANDMOTHER, and also concepts that are created on the basis of abstract experience, such as the concepts GRAMMAR and SYNTAX. Created concepts are learned, internalized, by most people, but even such concepts are initially created by some individual mind, so they must somehow be compatible with or licensed by innate concepts.

Another question arises: Are basic concepts part of and thus provided directly by UG or are they part of another mind-internal but language-external department? I assume that the latter is the case and refer to the department or subsystem in question as the *Concept Mine*. UG and narrow internal syntax has access to the Concept Mine. Other animals have concepts and conceptual systems (see, for example, Gallistel 2011; Berwick & Chomsky 2011: 39; Tallerman 2014), which I take to show that concepts are distinct from language (albeit integrated into language as the individual matures).[4] However, other animals don't have syntax. The *Syntax-Concept Access* is unique to humans, a prerequisite for the evolution of language. If the evolution of language involved only one mutation, yielding Merge (Hauser et al. 2002; Berwick & Chomsky 2011), then we would expect language to be a widespread biological property, contrary to fact. If it involved at least two unrelated mutations, yielding *Simplest Merge* (see shortly) and the Syntax-Concept Access, then its uniqueness to humans is immediately more understandable. While Simplest Merge seems to be widely found, presumably paving way for language and many other capacities (Katz & Pesetsky 2011), the Syntax-Concept Access is an additional property, found in only humans in the biological world.[5]

I refer to the concept collection as a mine, as syntax "digs" into it in search of material. It is not a language of thought, LOT. Syntax, internal language (I-language), is (in tandem with the semantic interface, see shortly). There is no special LOT, distinct from I-language. Assuming LOT, distinct from I-language, "leads to an explanatory regress as well as being unnecessary and quite obscure" (Berwick and Chomsky 2011: 38, fn. 6). While there can hardly be any doubt that the Concept Mine is somehow structured, it is unclear whether it has structures that resemble linguistic structures, and I will not speculate on the question. For

[4] Notice that this is not to say that the initial Concept Mine is identical across species; it is presumably not.

[5] A reviewer raises the question of whether binary branching and hierarchical relations are found outside of language. I believe they are. In my view, these phenomena follow from the interaction of Simplest Merge with general architectural principles (see Chomsky 2005), but, as I will not discuss hierarchical relations here, I set these issues aside.

my purposes, it is sufficient to assume that the initial Concept Mine is minimally a collection of basic concepts (and not a collection of "lexical items", see below).

Intriguingly, there are non-trivial constraints on the syntax-concept relation, as evidenced by the fact that only a limited set of conceptual categories enter formal grammars: NUMEROSITY and TIME, for example, in contrast to COLOR or BRIGHTNESS (Cinque 2013; Adger 2018). It is also noteworthy that derived and created concepts and words never seem to trigger grammar phenomena that are incompatible with or separate from the grammar phenomena that interact with basic, innate conceptual categories, such as TIME.[6] Another intriguing issue is that unimaginable concepts really are unimaginable. We can imagine ungrammatical sentences, utterances that are highly unlikely to be ever expressed in normal language situations, but we cannot imagine impossible concepts. That is something to think about. It does not obviously have anything to do with reality. We can easily imagine things and events we have never experienced, but we cannot point at a potential concept and say that it is an impossible one (a paradox), which is perhaps related to the fact that we cannot pinpoint impossible feelings either. This is a major stumbling block in the study of concepts.

UG, then, has no words or expressions in the regular sense, but does it contain items in some technical sense? Chomsky has long assumed that UG has what he refers to as "lexical items", but he has expressed disparate and conflicting views on the issue. Two of his suggestions are given in (1)–(2).

(1) **The Feature Array Approach:** In Approaching UG from below, Chomsky (2007: 6) 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."

(2) **The Single Item Approach:** In On Phases (2008: 139) Chomsky suggests "that a language has the simplest possible lexicon: just one LI [= Lexical Item], call it "one". Application of Merge to the LI yields {one}, call it "two". Application of Merge to {one} yields {one, {one}}, call it "three". And so on."

I adopt the Single Item Approach, with some specifications.

Adopting the terminology in Sigurðsson 2011, I refer to the single initial element as *Root Zero*, zero as it has no content. One can conceive of it as a cell that awaits being arbitrarily filled with some material from the Concept Mine, for example the concept MOTHER (yielding $[\sqrt{\text{mother}}]$). As soon as Root Zero has been filled, thereby becoming Root One, the language faculty creates a copy, making

[6] However, the reverse is not true. Higher numerals, for example, are plausibly derived, and they commonly do not partake in the same agreement processes as do the lower numerals.

Root Zero available anew, this new copy awaiting to get arbitrarily filled with some content, say FATHER, yielding Root Two, and so on.[7]

In addition to Root Zero, UG must provide the Edge Feature, as argued by Chomsky in On Phases. I quote Chomsky on this in (3).

(3) Chomsky (2008: 139):
For an LI [= Lexical Item] to be able to enter into a computation, merging with some SO [= Syntactic Object] … it must have some property permitting this operation. A property of an LI is called a *feature*, so an LI has a feature that permits it to be merged. Call this the *edge-feature* (EF) of the LI. … The fact that Merge iterates without limit is a property at least of LIs – and optimally, only of LIs, as I will assume. EF articulates the fact that Merge is unbounded, that language is a recursive infinite system of a particular kind.

I refer to the Edge Feature, in the singular, as *Edge Feature Zero*. Like Root Zero, it may be filled with content from the Concept Mine and copied or multiplied. Refer to this Root Zero + Edge Feature Zero approach as the *Zero Hypothesis*. The conceptual content of edge features, in the plural, is typically vaguer than that of roots, though, an issue I will return to in section 5.[8]

Edge features, in the plural, are building elements, like roots, and what we may properly refer to as lexical items is formed by merger of roots and edge features (for example [n-$\sqrt{\text{mother}}$]). I assume that edge features are involved in any instance of internal and external Merge, any structure building, and not only the formation of lexical items. It follows that symmetric structures in the sense of Moro (2000) and Chomsky (2013) are impossible, not because they cannot be labelled, as argued by Chomsky, but because they cannot be formed in the first place. An edge feature must be part of any application of Merge, so the formation of seemingly symmetric structures, such as small clauses of the form [XP, YP], must involve one or more silent edge features, as sketched in (4).

(4) [XP [EF^{n} [YP]]]

A unit or a structure may merge with a single edge feature, but, as indicated by the n-superscript on EF in (4), there is in principle no upper limit to the number of edge features merged. Edge features come for free, and multiple specifiers must

[7] Complex word formations, for example in polysynthetic languages or in cross-linguistically widespread expressions like English *screaming-out-loud-kind-of-a-person*, are in part post-syntactic, so I set such formations aside here.

[8] Even though roots are pliable, as Jim Wood reminds me (see also Wood 2015). He explains: " … the meaning of a root, say $\sqrt{\text{run}}$, is quite pliable, and can fit to the structure. So *I ran to the store* involves motion, *I ran these over to my friend* can mean 'I drove them to him/her', *My fridge is running well* can mean 'working', *I ran out of X* can mean 'I don't have X anymore', etc."

each merge with at least one edge feature ([EF^n XP [EF^n YP […]]]). Stacking without edge features is precluded. Call this the *Generalized Edge Feature Approach*, GEFA (which is accidentally the spelling of the Icelandic verb *gefa* meaning 'give').

(5) GEFA: Any application of Merge involves at least one edge feature

GEFA assumes Simplest Merge, not calling on any extra stipulations or tools, such as Pair-Merge in Chomsky 2004 or the Hilbert epsilon operator in Chomsky 2019a, used by Chomsky to analyze adjunction and seemingly unstructured coordination, as in *John is tall, happy, hungry, bored with TV* (Chomsky et al. 2019). GEFA might be too simple, but I optimistically assume that it is correct. Any additional Merge tools violate minimal design and should thus be avoided if possible.[9]

Basic lexical semantics is provided by the Concept Mine, via syntax, while additional semantics is provided by pragmatics in the broad sense, arising at the semantic interface from the interaction of syntax with other mental systems and the context. Obviously, though, the semantic interface has access to syntactic/lexical semantics, molding it with pragmatics (as we will see for Gender in section 4). That is, the Concept Mine is directly accessed by syntax, and then indirectly accessed by the semantic interface, via syntax. In the words of Chomsky (2019b: 276): "every object that's generated must be available for later computations".

This much seems clear. However, in other respects, the nature of the semantic interface or the conceptual-intentional interface, C-I, remains poorly understood. Chomsky (e.g., 2001, 2007, 2008) uses the terms "semantic interface" (or "semantic-pragmatic interface") and "conceptual-intentional interface" interchangeably, and he uses these terms, especially the latter, very frequently, but he is noticeably silent about the nature of this interface. Berwick et al. (2013: 90) are slightly more specific, stating that PF, the sensory-motor interface, connects "the mental expressions formed by syntactic rules to the external world", while the "conceptual-intentional interface … connects these same mental expressions to semantic-pragmatic interpretation, reasoning, planning, and other activities of the internalized 'mental world'." I adopt the view, as do these authors, that the semantic interface is post-syntactic (distinct from internal syntax, often referred to as Logical Form, LF), taking "the mental expressions formed by syntactic rules" as input, connecting them to each other across context and also to "other properties of the internalized 'mental world'." Berwick & Chomsky (2016: 11) refer to C-I as "a conceptual system for inference, interpretation, planning, and the organization of action – what is informally

[9] GEFA is just a simple statement or hypothesis in the present context. I cannot go into a detailed technical discussion of Merge here, but for such a discussion, see for example Epstein et al. 2015, Collins 2017, in addition to Chomsky et al. 2019, and Chomsky 2019a; 2019b.

called “thought”.” I assume that both syntax and C-I provide and contribute to thoughts, jointly.

2 Syntactic features are *not* selected

All this is universal. On a biological view of the language capacity that makes sense. Assume it to be correct. How do we then understand language variation, including variation with regard to functional categories? One rather traditional way of conceiving of this issue is the Feature Selection Approach in (6).

(6) **The Feature Selection Approach:** In Derivation by Phase (2001: 10) Chomsky suggests that the Faculty of Language (FL) “specifies the features **F** that are available to fix each particular language L … We adopt the conventional assumption that L makes a one-time selection [F_L] from **F**. These are the features that enter into L; others can be disregarded in the use of L”.

The Feature Selection Approach relates to the Borer-Chomsky conjecture, formulated by Baker as in (7) and by Chomsky as in (8); see also, for example, Roberts & Holmberg (2010: 32):

(7) **The Borer-Chomsky Conjecture** (Baker 2008: 156):
All parameters of variation are attributable to differences in features of particular items (e.g. the functional heads) in the lexicon.

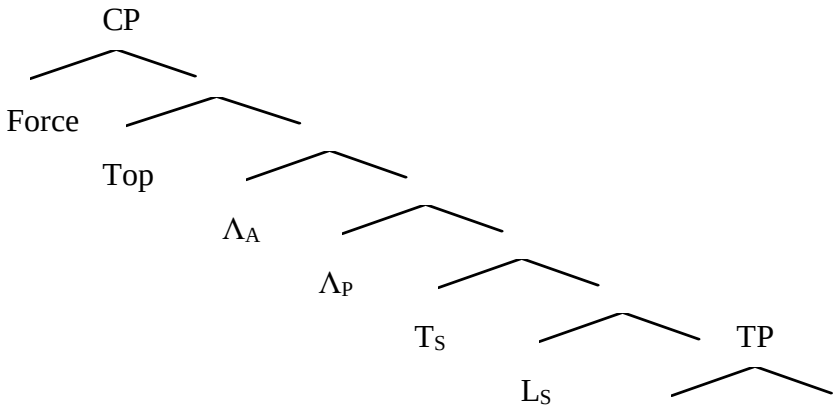
(8) **The Borer-Chomsky Conjecture** (Chomsky 2001: 2):
… parametric variation is restricted to the lexicon, and insofar as syntactic computation is concerned, to a narrow category of morphological properties, primarily inflectional.

On the Feature Selection Approach, UG contains a universal pool of features **F**, from which languages each make their own specific selection. However, that is a gross simplification. Selection hardly applies to, say, C, v, n. Given the Zero Hypothesis, the content of entities such as C and v, inasmuch as they do have content, is not provided by UG but by the extra-linguistic Concept Mine. In fact, so-called functional “heads”, including, for example, C, v, D, n, are not discrete entities or items but domains that contain an array of elements that are each below the level of materialization, like quarks, and at least many such quarks, perhaps all, are variables rather than constants.

Consider C, for example. On the *context-linking* approach, argued for in Sigurðsson 2014 and Sigurðsson 2019, C contains a number of edge features that are like quarks, referred to as *edge linkers*, including the Force and Topic features of Rizzi (1997), Speech Time plus Speech Location (together corresponding to

Rizzi's Fin), and speaker and addressee features, here referred to as Logophoric Agent ("speaker") and Logophoric Patient ("addressee"), as they do not really denote actual speakers and addressees, an issue I will not go into here. This is sketched in (9).

(9)



Λ_A = Logophoric Agent ("speaker"), Λ_P = Logophoric Patient ("addressee")
T_S = Speech Time, L_S = Speech Location (and T_S + L_S = Fin)

This is too simple a picture of the clausal left periphery; for example, it disregards the high mood and modality features argued for in Cinque 1999, the jussive category in Zanuttini et al. 2012, and the different Topic feature types discussed in the cartography literature (see, e.g., Frascarelli 2007). Importantly, all these elements are below the level of lexicalization or materialization – none of them is ever independently spelled out in any known language. It follows that the diagram in (9) is not only incomplete but also overly specific; as the C-categories are below the level of materialization, their order and hierarchical correlations are undecidable, which is the reason why researchers commonly operate with C as a cover term.

It might seem to be a puzzle or even a contradiction that these elements cannot be independently spelled out, but it is evidently a fact. Thus, no language is known to separately spell out a Speech Time *now*, Speech Location *here*, or a Logophoric Agent *I*: *I now here Prices slumped*, instead of *Prices slumped*, and so on (see Ross 1970: 224; Sigurðsson 2014). This cannot be a coincident.[10] In this respect, the clausal edge features are like the relators in den Dikken 2006, the silent elements that relate predicates and their subjects in den Dikken's approach. The reason is that these silent elements mediate relations; if they were spelled out in situ they

[10] It is a different issue, which I will not discuss here, that edge features can have spelled-out correlates, in the clausal left edge or elsewhere within the clause (see, for example Speas & Tenny 2003; Hill 2007).

would presumably be interpreted in situ and thus be unable to function as relators or linkers. It might seem a priori thinkable that instead of being silently generated in the left edge they are generated lower in the structure and moved to the left edge, thus being interpreted both high and low, like A- and A-bar moved constituents, but there is no evidence in support of that view, so assuming it "leads to an explanatory regress as well as being unnecessary and quite obscure", to again cite Berwick and Chomsky's remark (2011: 38, fn. 6) on a putative separate LOT.

C is a domain of largely silent categories that are either not materialized at all or jointly materialized. Thus, it is commonly spelled out as underspecified elements, such as *that* and *if*, or completely silent, as in regular English clauses like *John was dancing* and *I believe John was dancing*.

(10) a. [$_{CP}$ __ [$_{TP}$ John was dancing]]
b. I believe [$_{CP}$ __ [$_{TP}$ John was dancing]]
c. She saw [$_{CP}$ **that** [$_{TP}$ John was dancing]]

Language, then, is full of silent elements, dark matter, like the universe. The Generalized Edge Feature Approach, GEFA, crucially assumes that edge features come for free and are not individually or separately spelled out.

Feature Selection is not in principle excluded by or incompatible with the Zero Hypothesis. However, edge features, including the ones in (9), are not selected. They are universal, part of any human language. Thus, for example, Speech Time enters the computation of Tense in all languages, Logophoric Agent and Logophoric Patient enter the computation of Person in all languages, and so on, regardless of how the categories of Tense and Person are expressed. Consider the simple clause in (11).

(11) I saw you here yesterday.

That edge features, such as Speech Time, Speech Location, Logophoric Agent and Logophoric Patient, are not lexical constants but variables is simply evidenced by the fact that utterances, for example the one in (11), may have infinitely many interpretations, depending on who addresses whom, where and when (see, for example, Banfield 1982).

Edge feature variables, such as Speech Time, get interpreted at the semantic interface in relation to the context and simultaneously in relation to clause internal elements, such as Event Time. They are relational.[11] T_S is normally valued as identical (simultaneous) with the speaker NOW under control (context scanning), as sketched in (12).

[11] The following presentation is based on my previous work, including Sigurðsson 2004, 2016, 2019.

(12) NOW [$_{CP}$ … T_S ...]

↑_ _ _ _ _ _ _ _ _ ↑ Control (yielding identity)

identical

Clause-internal Event Time and Reference Time (in the sense of Reichenbach 1947), here denoted as T_E and T_R, are in turn computed in relation to the T_S value, as past, non-past, and so on. I illustrate this in (13) for the simple past tense, where $T_E = T_R$ (as in, e.g., *Mary wrote the letter*), and in (14) for the *past-in-the-past* reading of a past perfect clause (such as *Mary had written the letter*).

(13) Mary wrote the letter.

[$_{CP}$ … T_S ... [$_{TP}$ ... T_R ... [$_{vP}$ ... T_E ...]]] Simple past: $T_S > T_R = T_E$

wrote *wrote*

↑_____↑↑_____↑ Agree (yielding valuation)

past non-past

(simultaneous)

(14) Mary had written the letter.

[$_{CP}$ … T_S ... [$_{TP}$ ... T_R ... [$_{vP}$ ... T_E ...]]] Past-in-the-past: $T_S > T_R > T_E$

had *written*

↑_____↑↑_____↑ Agree (yielding valuation)

past past

That T_S is a variable, and not a constant, is evidenced by *sequences of tenses* (SOT). Subordinate clauses have a secondary, embedded T_S (the perspective time in Kiparsky 2002) that may either be set by default as identical with the speaker NOW (via the matrix T_S) or as identical with the matrix clause Event Time, T_{E1}, the latter being the case in SOT clauses, as illustrated in (15).

(15) (When I called her) Mary$_i$ **said** that she$_i$ **was** writing a letter.

[$_{CP}$ … T_{E1} … [$_{CP}$ … T_{S2} ... T_{E2} …]]

said *that* *was (writing a letter)*

↑_ _ _ _ _ _ _ _ _ ↑↑_____↑

identical non-past (“present”)

Control Agree

Past tense forms in SOT, such as *was* in (15), are uninterpreted at the semantic or the conceptual-intentional (C-I) interface, arguably being formed in PF morphology (i.e., after transfer), hence invisible at C-I, as suggested by the fact that languages such as Russian and Japanese have the same SOT semantics as English in examples comparable to (15) without concomitant overt Tense agreement: (When

I called her) "Mary said that she *is* writing a letter"; see for example Comrie 1986, Ogihara 1996. What is Tense interpreted at C-I in (15), as in the corresponding Russian and Japanese structures, is the syntactic relations between T_{E1}, T_{S2}, and T_{E2}, and not the overtly tensed form *was*.[12] In Distributed Morphology, it is assumed that there are abstract morphemes such as [past] that are primitives, "drawn from a universal feature inventory", as Embick & Noyer (2007: 296) put it, but that is off the track. Past is a relation in syntax, and not a building block until in morphology.

Tense computation is syntactic, subject to minimality. This is evidenced by the Tense shift seen in SOT (Sigurðsson 2019). Consider (16), where the indexing indicates Tense identity (simultaneousness).

(16) a. Mary **said$_{\mathbf{i}}$** at breakfast that she **was$_{\mathbf{i}}$** writing a letter.
b. At dinner Bill claimed$_{\mathbf{k}}$ that Mary **said$_{\mathbf{i}}$** at breakfast that she **was$_{\mathbf{i/*k}}$** writing a letter.

The time of Mary's writing in (16b) is "present" in the sense that it is simultaneous to the time of her saying, cannot be distinct from it (e.g., past in relation to the saying) and instead the same as some different Event Time, for example that of Bill's claim at dinner. This locality is expected on a syntactic approach to Tense computation, while it would be mysterious on a global semantic account. The computation of Tense is subject to minimality and immune to pragmatics.[13]

Much the same applies to the computation of Person, and close parallels have been argued to hold for Case and Gender as well (Sigurðsson 2012, 2019), see further on Gender in the following. To repeat, none of this is selected, into or out of syntax. It is all there in the syntax of all languages.

3 Morphological features *are* selected

Obviously, though, categories such as Tense, Person, Case, and Gender are differently externalized in different languages. Take Gender, for example. More than half of the languages in Corbett (1979; 1991), 145 out of 257, have no grammatical genders. However, even languages that lack grammatical gender have semantic

[12] The morphological [past] being passed down the Tense chain under top-down PF agreement.

[13] This goes back to Sigurðsson (2004). Even double access Tense readings are accommodated (Sigurðsson 2016), but I refrain from discussing that here. As pointed out by a reviewer, Stowell (e.g., 2007) also argues that Tense computation is syntactic, but his implementation is very different from mine. I set this aside.

lexical gender. Finnish *tyttö* 'girl', *poika* 'boy', Hungarian *lány* 'girl', *fiú* 'boy', and so on. Semantic or conceptual features that enter grammatical gender systems, such as HUMAN, ANIMATE, MALE, FEMALE, are, unsurprisingly, universally accessible in the Concept Mine. When Finnish syntax forms the noun *poika* 'boy', it merges the root $\sqrt{\text{poik}}$ with edge features, including *n* and a gender feature, yielding (17).

(17) $[g_{\text{MALE}}\ [n - \sqrt{\text{poik}}]]$

Gender is thus present in Finnish syntax, hence interpretable at the semantic interface. However, it is grammatically silent; it does not get marked, and it does not partake in agreement processes. Actually, it is a peculiar property of gender in many gender languages that it is locally invisible on the noun itself, while being visible at distance via gender agreement.[14] So, what Finnish lacks is not syntactic Gender, but morphological gender values and hence also agreement processes that take such values as input.

Morphology is largely meaningless across languages, but it is not meaningless within individual languages. That is a great challenge to any potential theory of externalization. How can it be that elements that enter meaningful relations in all languages are invisible, remain non-externalized in many, sometimes most (or even all), languages? That leads us back to Feature Selection. There is no Feature Selection in syntax, but there *is* Feature Selection in PF, the externalization compartment. That is where variation arises (Sigurðsson 2000 and subsequent; Berwick & Chomsky 2011; Boeckx 2011). Thus, Icelandic and Italian, for example, select to express the feature [masculine] in inflectional morphology, while Finnish selects not to do so. In this sense, Gender is grammaticalized in Icelandic and Italian, as opposed to Finnish. I use the notion "grammaticalized" in this informal sense, as stated in (18).[15]

(18) A formal feature is grammaticalized if it is systematically expressed or has systematic correlates in PF

So, languages vary as to which features they grammaticalize. Any formal feature "grammaticalization decision", thus, involves a parametric valuation that takes the general form in (19).

(19) Grammaticalize formal feature X

[14] That is, such languages have what Greenberg (1978) refers to as *covert gender* (see also Corbett 1991), in contrast to languages such as Swahili, with an overt agreement marker on the noun itself. In my view, the Swahili type is not properly understood as a gender system, but I set this aside here.

[15] Similar ideas abound in the parametric literature (see, for example, Longobardi 2006).

As we will see, though, the notion "formal feature" is distinct from, albeit related to, the notion "syntactic feature". However, as formal features have a syntactic base, it follows that all formal feature grammaticalization has a syntactic base, and, as initial syntax (UG) is uniform across languages – or humans – it also follows that all grammatical markings reflect syntactic features that are accessible in all languages, even in languages that never show any markings for the features or categories in question. This follows Cinque (1999, 2013) in spirit, but I do not take stand on how the order and potential hierarchical relations of features come about. Let me just point out that grammaticalization affects learnability. It is generally hard for learners to master a category in a foreign language that is not grammaticalized or differently grammaticalized in their native language, for example Gender. However, purely syntactic features such as Speech Time and Logophoric Agent never seem to pose any second language learning problems, naturally so if they are innate and do not require any externalization learning.

4 Categories, features, parameters, rules – and the case of Gender

"Formal feature" in (18) and (19) has two senses. It refers to categories, such as Case and Gender, as well as their values, such as [dative] and [feminine]. See Adger & Svenonius (2011), who refer to categories and their values as first-order vs. second order features, where first-order features are attributes, while second order features are values. See also Roberts (2019). Feature values are somehow hierarchically ordered under their respective categories or attributes, as discussed for Person in a 2002 paper in *Language* by Harley & Ritter: [accusative], [dative], and so on, are ordered under the category of Case, while [masculine], [feminine], and so on, are ordered under the category of Gender. We have no clear understanding of how and where this ordering or grouping comes about; as pointed out by Harley & Ritter (2002: 518), it is unclear how their morphological feature geometry relates to syntax. Major categories, Case, Person, Tense, Gender, and so on, seem to be the co-operative products of syntax and the externalization compartment. That they are not purely syntactic is simply evidenced by the fact that they do not get purely semantic interpretations. The masculine and feminine genders commonly mark males vs. females, but, as we all know, there are loads of exceptions. Italian *luna*, German *Mond*, Icelandic *tungl* all mean 'moon', but *luna* is feminine, *Mond* is masculine, and *tungl* is neuter. German *Mädchen* means 'girl', but it is neuter, Icelandic *kvenmaður* means 'woman', but it is masculine.

The Gender category plausibly has a syntactic base in all languages, but the gender values partly live their own lives in morphology. Normally, *luna* triggers feminine agreement, *Mond* triggers masculine agreement, and *tungl* triggers

neuter agreement. Conversely, semantic gender is detectable even when not marked in a noun phrase or on a pronoun, so Gender is both syntactic and post-syntactic, an issue I will return to shortly.

The basic parameter that underlies Gender systems takes roughly the form in (20).

(20) Grammaticalize Gender markers

If this is right, and it is difficult to see how it could be seriously wrong, then the underlying Gender category must be an abstract variable, open to a number of values, including [feminine] and [common gender], for example. (20) is a macro parameter in the sense of Baker (2008); Roberts & Holmberg (2010); Roberts (2019), and given the approach pursued by these researchers, in particular Roberts (2019), it relates hierarchically to a number of micro parameters. One such micro parameter or sub-parameter must range over gender values, [animate], [feminine], [common gender], and so on, and another one must specify which parts of the lexicon is amenable to gender markings, for instance only singular third person pronouns, as in English and Afrikaans, or basically the whole noun lexicon, as in many gender languages, including Italian and Icelandic. In addition, gender parameters interact with agreement parameters. For example, predicative adjectives and past participles show gender agreement in Italian and Icelandic, but not in German. Only determiners partake in gender concord in Swedish, while almost any DP-internal modifier does in Icelandic, including determiners, adjectives, and quantifiers. And so on. Sorting all this out from a hierarchical parametric perspective is not an easy task. As far as I am aware of, no one has ever tried to.

Parameters alone cannot account for or describe all variation. Reasonably, early acquisition proceeds largely by sweeping parameter settings, but the settings are soon complemented by numerous rules of exceptions, due to irregularities in the linguistic input (see Yang 2016). One type of variation that is arguably unrelated to parameter settings is inflectional class variation, of verbs, nouns, and so on, in many languages (see Svenonius 2007). I will not dwell on rules of exceptions here, so I only mention one other peculiar example. Regular Icelandic adjectives and past participles have 144 feature combinations: 4 cases, 3 genders, 2 numbers, 3 degrees, 2 "strengths" (roughly definite vs. indefinite), and these combinations are expressed by 30 distinct forms. For illustration, "only" the 24 combinations and the 13 different forms of the adjective/participle *komin-* 'arrived' in the simple positive "strong" inflection are given in (21).

		NOM	ACC	DAT	GEN
(21)	M.SG:	kominn	kominn	komnum	komins
	F.SG:	komin	komna	kominni	kominnar
	N.SG:	komið	komið	komnu	komins
	M.PL:	komnir	komna	komnum	kominna
	F.PL:	komnar	komnar	komnum	kominna
	N.PL:	komin	komin	komnum	kominna

However, all this richness is wiped out in case the adjective has a non-monosyllabic stem that ends in a vowel: for instance, bisyllabic, as *hiss**a*** 'surprized', *hugs**i*** 'pendent', *sveit**ó*** 'provincial', trisyllabic as *ljómand**i*** 'shining, excellent', and so on. Adjectives of this sort reject all inflection. So, after having learned parameter settings and rules that yield regular adjectival agreement inflection, Icelandic children learn that none of these apply for non-monosyllabic adjectives with a stem in a vowel. This exception is a rule or a convention – it is plausibly not regulated by a micro parameter, as suggested by the fact that it does not have any parallels in related languages.[16] The complete absence of inflectional morphology in non-monosyllabic Icelandic adjectives with a stem in a vowel means that such adjectives are just like English adjectives. Even in Icelandic, then, inflection is syntactically unnecessary – it is not regulated in syntax (as underlined by the existence of inflectional classes). This applies to inflection in general, declination, conjugation and so on, and not specifically to adjectival inflection. Inflection is reasonably based on syntax and parameter settings, by and large at least, but the parameters are externalization parameters, and the inflection itself takes place in the externalization compartment, commonly referred to as PF; obviously, it does not take place in syntax, or else we would expect languages to be inflectionally similar. Nothing could be farther from the truth.

Grammatical categories, Case, Tense, Person, Number, Gender, and so on, are both syntactic and post-syntactic. We saw this above for Tense. While syntactic Tense computation relates Speech Time, Reference Time, and Event Time, T_S ,T_R, and T_E, the computed relations between these elements are expressed by post-syntactic markers, such as English past tense -*ed*. Let me illustrate this syntax-morphology interaction further for only Gender. The semantic or conceptual features MALE/FEMALE are syntactic, incorporated into syntax from the Concept Mine, but [masculine/feminine/neuter], and so on, are post-syntactic morphological features, formal features. Only some nouns have syntactic/semantic MALE/

[16] Plausibly, though, it can be analyzed in phonological terms, but I will not try to do so here. I assume that micro parameters and rules of exception must be kept apart, even though the drawing line is often unclear.

FEMALE gender, while, typically, all nouns in gender languages have some formal, morphological gender (Greenberg 1978). For example, Icelandic has two common nouns that mean 'car'. The everyday noun *bíll* is masculine, the more formal *bifreið* is feminine, but neither has syntactic MALE/FEMALE gender, of course. Now, if Gender was entirely non-syntactic, only a morphological or a lexical/morphological quirk, as sometimes assumed, then we would not expect semantic/syntactic MALE/FEMALE gender to ever have any morphological effects that are independent of formal gender. However, this is not so. There are numerous and various cases of semantic MALE/FEMALE gender alone triggering gender agreement, without any aid of formal gender. This phenomenon has been widely observed and discussed (by Corbett 1991 and others) for animate nouns that lack MALE/FEMALE gender semantics and may thus refer to individuals regardless of biological sexes: *doctor*, *minister*, *hero*, *poet*, *dog*, *horse*, and so on. An Icelandic example is given in (22).

(22) Læknir-**inn**/*-in/*-ið var mjög ánægður/**ánægð**/*ánægt.
doctor-the.M/*F/*N was very pleased.M/F/*N
'The [female] doctor was very pleased.'

The noun *læknir* 'doctor' is a masculine noun, triggering obligatory DP-internal concord, as on the suffixed article in (22). When the 'doctor' referred to is a male, the predicative adjective is also obligatorily masculine, *ánægð**ur***. However, when the 'doctor' in question is a female, as in (22), the predicative adjective may either heed formal masculine agreement or show up in the feminine, *ánægð*, by semantic agreement. The DP containing the noun is assigned semantic/syntactic FEMALE value at the D-level, above the n-level (where [masculine] is assigned), and it is this value that triggers the optional feminine agreement of the predicate, overriding regular formal agreement.[17] This is not confined to masculine nouns. The noun for 'hero' is feminine *hetja*, but when it refers to a male hero it may trigger masculine predicate agreement. The noun for 'poet' is neuter *skáld*, and, in addition to formal neuter agreement, it may trigger either masculine or feminine predicate agreement, depending on the biological or social gender of the referent.

First and second person pronouns in Icelandic, as in most other gender languages (Siewierska 2004), have no formal gender, but they have semantic gender that triggers obligatory predicate agreement. This is illustrated for only the first person singular pronoun *ég* in (23) (and notice that "male" and "female" here refers to a person's gender SELF, regardless of what it is).

[17] In the analysis in Sigurðsson 2019, formal n-gender may or may not project to the D-level. Most commonly it projects, and then formal predicate agreement is obligatory. DP-internal gender concord is generally triggered by n-gender.

(23) a. [A male speaking:]
Ég er **ánægður**/*ánægð.
I am pleased.**M**.SG.NOM
'I am pleased.'

b. [A female speaking:]
Ég er **ánægð**/*ánægður
I am pleased.**F**.SG.NOM
'I am pleased.'

Strikingly, the same applies to speaker-inclusive PRO (Sigurðsson 2019), as illustrated in (24).

(24) a. [A male speaking:]
Það er mikilvægt fyrir mig_i [$_{CP}$ að [$_{DP}$ PRO]$_i$ vera **ánægður**/*ánægð].
it is important.N.SG for me C be pleased.**M**.SG.NOM
'It is important for/to me to be pleased/content.'

b. [A female speaking:]
Það er mikilvægt fyrir mig_i [$_{CP}$ að [$_{DP}$ PRO]$_i$ vera **ánægð**/*ánægður].
it is important.N.SG for me C be pleased.**F**.SG.NOM
'It is important for/to me to be pleased/content.'

While semantic gender values, such as MALE and FEMALE, are incorporated into syntax from the Concept Mine, thereby becoming syntactic, formal gender features like [masculine] and [feminine] are post-syntactic, assigned in morphology. As we have seen, formal gender may or may not correspond to syntactic gender.

Gender, whether formal or purely semantic/syntactic, relates CP-external discourse participants and CP-internal event participants. We see this for formal gender in examples like the simple Icelandic and Italian sentences in (25).

(25) a. $Bókin_i$ er spennandi. Ég kaupi **hana**$_i$.
book-the.**3F.SG.**NOM is interesting I buy "her".**3.F.SG.ACC**
'The book is interesting. I am buying it. / I will buy it.'

b. Il $libro_i$ è interessante. **Lo**$_i$ compro.
the book.**3.M.SG** is interesting "him".**3M.SG.ACC** (I) buy
'The book is interesting. I am buying it. / I will buy it.'

There are two sides to the coreference and the forms of the pronoun *hana* "her" in (25a) and the pronominal clitic *lo* "him" in (25b). First, the pronouns inherit or recycle the ϕ-values (person, gender, number) of their antecedent under context scanning (control). Second, the context-bound ϕ-values of these pronominal elements are computed in relation to *local* case, yielding the **3.F.SG.ACC** form *hana* and the **3.M.SG.ACC** form *lo*, respectively. This computation is syntactic.

Evidently, gender assignment and gender agreement in the examples above is sensitive to the context. Somehow, formal or semantic gender from the outside context enters CP syntax, triggering morphological agreement within the CP. In view of the widely adopted credo, since *Syntactic Structures* (Chomsky 1957), that syntax is context free, this is a truly intriguing phenomenon, but it has raised remarkably limited interest in the minimalist literature.[18] Recent exceptions, though, include Kučerová (2018), Conrod (2019), and Sigurðsson (2019). According to the analysis in Sigurðsson (2019), CP-external gender enters CP syntax by *edge computation*, as informally defined in (26) (= (10) in Sigurðsson 2019: 732).

(26) *Edge computation*

For any phase edge, P_E, it holds that:

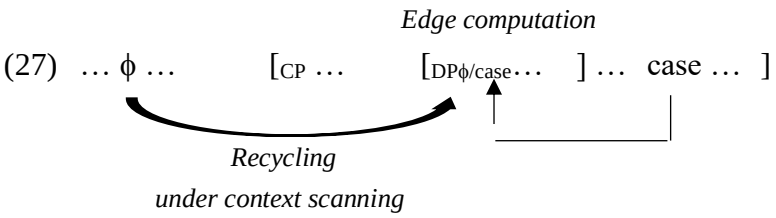
a. P_E has syntactically active edge linkers

b. P_E recycles features (properties) from the phase context, either the overt linguistic context or the silent speech act context, via the edge linkers.

c. The so recycled features are computed at P_E in relation to an element or elements in the inner phase.

Edge linkers, perhaps edge features in general, are variables, valued in the syntactic process. The Speech Time, T_S, for example, is an edge linker or an edge feature in the C-domain, valued under control from the context, subsequently entering edge computation in relation to CP-internal tense elements, as illustrated in (12)–(16). Similarly, gender at the DP-level, D-gender, is a variable that is valued under contextual control or context scanning, whereby contextual gender is recycled and subsequently computed in relation to CP-internal elements, including case, as sketched in (27) (cf. (29) in Sigurðsson 2019: 743).

(27)



Subsequently, abstract CP-internal Agree builds an agreement path between the DP and the predicate, DP_ϕ … $PRED_\phi$, and when the ϕ-values of the DP have been specified, under context scanning and edge computation, they percolate down to the predicate (see Sigurðsson 1989: 114–118, E. Sigurðsson 2017, Kučerová 2018). The percolation of the specified or valued features (in contrast to abstract Agree) is arguably a PF process (see Sigurðsson 2006, and, for example, Landau 2016).

[18] Merge is context free, syntax in general is not.

Gender relates CP-external discourse participants and CP-internal event participants, so the reason why gender features are computed in relation to case is plausibly that case, in turn, relates to the θ-roles of event participants.

5 The syntax-to-PF-morphology metamorphosis

Morphology is based on syntax, but it is also split from it. Due to physical constraints on externalization modes, audible, visible or tactile, morphological objects are bound to be discrete, like for example the English past tense marker *-ed*. Internal syntax, on the other hand, works with syntactic relations and elements of thought (cf. Berwick & Chomsky 2011), such as the Tense atoms T_S,T_E, and T_R, and computes relations between such elements, across domains, including phases. We all know that phonology is radically distinct from morphology, although the former represents the latter (Burton-Roberts 2011). The phonological shape of an element like past tense *-ed*, analyzed in terms of features such as vowel, consonant, voiced, and so on, has nothing to do with its semantic/syntactic content. Morphology is also distinct from syntax, albeit not as radically. The relation between the two, arising under transfer, is reminiscent of incomplete metamorphosis (also called hemimetaboly); I refer to it as the *syntax-to-PF-morphology metamorphosis*. The computed syntactic relations between T_S,T_E, and T_R are expressed by elements like the past tense marker *-ed*, but such markers are not the same elements as the Tense atoms. There is a closer affinity between semantic/syntactic MALE and morphological [masculine], but the two are crucially not the same, as underlined by the fact that many gender languages operate with [common gender], and not with [masculine] – and there are also languages that operate with both, such as Dutch and Swedish. Dependent case expresses the relation between an argument DP and its syntactic environment, but this relation is not the same as morphological [accusative], although it is commonly expressed or marked by the accusative, the Logophoric Agent is not the same element as first person markers in morphology, and so on and so forth (Sigurðsson 2004 and subsequent). There is a long-standing tradition in the generative paradigm to ignore the syntax-morphology metamorphosis, and to treat morphology as if it was part of syntax (most famously Halle & Marantz 1993, and Chomsky 1995, albeit in different ways). That is not so. It is high time that we recognize the syntax-to-PF-morphology metamorphosis. Developing a systematic understanding of it is a great challenge, though; we have hardly begun.

Morphology operates with elements of expressions, syntax with structural relations and elements of thought, so neither is part of the other, although they

are interrelated. Edge features are structural objects and also elements of thought, linking syntactic domains, but they are necessarily silent themselves. Perhaps even more surprisingly, in view of common assumptions to the contrary, is that they do not have any semantics on their own (Sigurðsson 2014). Their computed relations with other elements are interpreted at the semantic interface, but the features that enter the computation are not separately interpreted. For example, T_S, Speech Time, does not get any interpretation unless it relates to some T_E, Event Time. Sometimes, though, T_E is anaphoric in relation to T_S (as recently discussed by Wood & Zanuttini 2019), but even in such cases, it is the relation between the two that is interpreted, not only T_S "in isolation", as it were.

Semantic/syntactic MALE and FEMALE might seem to be different from the Tense atoms in this respect, but they are not. They relate discourse participants and event participants across clause boundaries, and they can only be interpreted in such a relation. The English pronoun *she* normally indicates that a female clause-internal event participant relates to (refers to) a given female discourse or situation participant. If an addressee does not discern any identifiable contextual antecedent of the pronoun, he or she is unable to interpret it and is thus bound to ask the interlocutor for background information: "*She* who?"

6 Concluding remarks

Initial syntax is uniform, but languages are variably outspoken or variably silent about syntactic features, the elements of thought. Language variation takes place in the externalization compartment, broad PF, but it is based on syntax, although inflectional class variation seems to be an exception (see Svenonius 2007; intriguingly, such variation seems to be entirely non-syntactic – as far as I can tell, different inflectional classes never show different syntactic behavior). Questions arise, many of them unanswerable at the current state of knowledge. The syntax-to-PF-morphology metamorphosis is mysterious. Most acutely, it is unclear how semantic/syntactic features, such as MALE and FEMALE, get transformed into morphological features like [masculine], [feminine], [common gender], and also why syntactically based morphological features commonly express properties that are only vaguely related or even seemingly unrelated to the semantics of the underlying syntactic features. The nouns for 'moon' have different genders in German, Icelandic, and Italian, but their gender markings or correlates are entirely non-semantic, at least synchronically, even though the gender systems of these and other gender languages are syntactically based. A related issue is in a way the opposite: It is unclear why some syntactic features, such as MALE and FEMALE,

sometimes, but only sometimes, get entirely unaltered "through" transfer from syntax to morphology.[19] Also, as parameters are not provided by UG, the question is where they come from, how they arise.[20] Parameters operate with or on selected PF features, and not on unselected purely syntactic features, so parameter setting is plausibly closely tied to the syntax-to-PF-morphology metamorphosis. Relevantly, parametrization does not seem to take place when and where syntactic features get unaltered through transfer (no metamorphosis): While the Italian and Icelandic nouns meaning 'moon', *luna* and *tungl*, trigger different predicate agreement (feminine versus neuter), first and second person pronouns (overt or null, including PRO), with only semantic/syntactic gender, trigger exactly parallel gender agreement in both languages.

It seems, then, that parameters are on the externalization side of language, part of or related to the sensory-motor system, facilitating motoric learning in language acquisition. If so, language parameters presumably have parallels in other motoric systems and motoric activities in both humans and non-humans, including for example music and birdsong (see Berwick et al. 2011). That is where we should look for a deeper understanding of parameters and parametric variation. However, morphological and word order parameters are special, in that they operate on the output of syntax, which is unique in the biological world.

In *The philosophy of grammar*, Jespersen famously stated that "no one ever dreamed of a universal morphology" (1992: 52), and Chomsky cited this statement in *The Minimalist Program* (1995: 3), and also in a preliminary version of Approaching UG from below (2007), but he deleted it in the final version of that paper, and, to my knowledge, he has never repeated it since. Perhaps, he concluded that it was too pessimistic. Let us remain hopeful and continue to believe that externalization variation can be fruitfully analysed as a reflection of general principles and the universal language capacity.

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[19] The same applies to Number: Sometimes, it seems to be purely semantic/syntactic, sometimes not. I set this aside here, though.

[20] A reviewer suggests that at least the format of parameters is provided by UG. However, if that was the case, UG would, implausibly, have to "know in advance" that there is going to be variation in externalization.

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