

Comparative syntax, morphology, and “externalization” (What happens at PF?)*

David Embick

Department of Linguistics, University of Pennsylvania

For S. Barbiers, N. Corver, and M. Polinsky eds. *The Cambridge Handbook of Comparative Syntax*, CUP

Submitted for typesetting in March, 2023

Abstract: This chapter examines various ways in which morphology has been implicated in studies of comparative syntax. A major theme in the discussion is how different theories define *morphology*, and how such definitions relate to research in morphological theory. The paper is organized around three large questions. The first concerns what it might mean to reduce syntactic variation to morphology or to the lexicon. Well-known approaches that are regarded as doing this have relatively little to do with morphology as understood in morphological theory; at the same time, one of these lines of research provides a plausible way of encoding variation in the features of syntactic terminals. A second question concerns what syntactic approaches to morphology like Distributed Morphology add to the study of universals and variation. I examine these questions with a focus on the PF (Phonological Form) interface, which plays a prominent role in this type of theory. A key theme is that there are possible universals in this part of the grammar, but care must be taken to seek them at an appropriate level of abstraction. Finally, I examine an alternative conception of PF that arises in certain Minimalist discussions. According to this view, the need to have syntactic structures connect with language-external systems— what is referred to as *externalization*— is responsible for apparent syntactic variation. If this conjecture were correct, much of what has previously been analyzed as part of the syntax is actually part of the PF component. However, it remains to be seen how it can be investigated empirically.

KEYWORDS: morphology, P(honological) F(orm), lexicon, externalization, locality, universals, variation

1 Introduction

There are at least two reasons to consider morphology in an overview of comparative syntax.

One is a matter of principle: a great deal of what is investigated in syntactic theory could be properly classified as *morphosyntax* (e.g. agreement- and case-related phenomena); this means that some of the concerns of syntax and morphology overlap (or are the same). Further developments in morphological theory produce additional connections that go beyond morphosyntax in this narrow sense. In particular, the move towards syntactic approaches to morphology— and especially those that attribute an important role to the interface of syntax with form, i.e. PF— leads to a further set of questions about how languages vary in this part of the grammar.

A second way of connecting morphology with comparative syntax implicates particular lines of theoretical practice. There are research programs that try to minimize or eliminate apparent syntactic variation by reducing it to morphology, or the lexicon, or the PF interface. An important goal of this paper is to articulate what these reductions amount to, and to ask how they relate to contemporary conceptions of morphological theory. Part of this project involves making core claims precise: which is

*For comments on and discussion of this paper I am indebted to Luke Adamson, András Bárány, Johanna Benz, Alison Biggs, Paula Fenger, Mohamed Lahrouchi, Lefteris Paparounas, Andrés Saab, Martin Salzmann, and Alexander Williams.

to say, identifying the roles different theories attribute to morphology and to PF in accounting for cross-linguistic variation. Another part involves bringing these proposals into contact with specific research questions by focusing attention on empirical considerations; a necessity when dealing with often quite idealized conceptions of how languages might vary.

As a precursor for the discussion to come, some comments are in order concerning what is to be understood by *comparative syntax* and *morphology*.

I take *comparative syntax* to be a line of research asking what is universal in the syntactic grammar of human language, and what is responsible for the *prima facie* ways in which languages differ: in terms of e.g. word order, which elements move where (and under what circumstances), what types of elements remain unpronounced, and so on; Chapter 2 of this book provides an overview. An important question in the discussion to come is what it might mean to say that languages are syntactically *the same*. This requires some attention because different theories make widely divergent claims about what is (“core”) syntax and what is not, with clear consequences for how variation is to be approached and understood.

Under *morphological theory*, I have in mind research directed at phenomena that sometimes fall under the traditional domain of morphology, and sometimes do not. At an abstract level, the questions to be answered are how morphemes are represented, how they are combined into complex objects, and how these objects are interpreted at the form and meaning interfaces. In the discussion to come there are two main morphological foci. The first of these is the theory of morphemes, understanding these to be syntactic terminals. The second concerns the nature of Phonological Form (PF), which plays a special role in contemporary theories of morphology. Each of these have been linked to syntactic variation, and my goal here is to explain how.

The three main sections of the paper concentrate on the following questions:

- (Q1) *What does it mean to say that syntactic variation is morphological or lexical?* Prominent proposals from Borer (1984) and Chomsky (1993) are typically interpreted as reducing syntactic variation to morphology or the lexicon. The goal of §2 is to examine what these reductions mean; both on their own terms, and from the perspective of morphological theory.
- (Q2) *What do current syntactic theories of morphology say about what might be universal, and what might be variable?* §3 outlines a syntactic approach to morphology, and highlights the role that PF plays in such a theory. This focus leads to a general discussion of locality conditions in syntax and PF, and how they might apply universally in morphology. A key theme in this discussion concerns how universals in the interface of syntax and form might manifest themselves; given the obvious and substantial ways in which languages appear to vary in this regard, potential universals must be relatively abstract.
- (Q3) *Is it possible to treat all apparently syntactic variation as part of PF?* The focus on PF in §3 provides a transition to §4, where I examine another line of work that implicates this part of the grammar. The relevant proposals, which arise within certain varieties of Minimalism, concern what is referred to as *externalization* (e.g. Chomsky 2011). The core idea is that cross-linguistic variation is found because of the need to connect the narrow syntax to language-*external* sensorimotor systems. A major theme in this discussion is what it might mean for the grammar to contain two displacement systems— one the narrow syntax, and the other part of PF— and how to develop this idea as an empirical claim.

Taken together, these questions implicate a tension between what certain syntactic theories say about morphology and variability, and what at least one morphological theory itself says. One my goals throughout the paper is therefore to clarify how different proposals addressing syntactic variation come into contact with the primary concerns of morphological theory.

2 Reducing variation to the Lexicon/morphology

In this section I will examine the idea that syntactic variation can be reduced to the lexicon or morphology: proposals typically associated with Borer (1984) and Chomsky (1993) respectively. These approaches share the intuition that syntactic variation should be encoded in a same part of the grammar responsible for representing other language-specific information. Some care must be taken to identify precisely what it means to call these proposals *lexical* or *morphological*. It turns out that connections with morphology in particular are tenuous. As will be reviewed below, Borer (1984) does not locate variation in the lexicon, but in rules that can in principle apply either in the lexicon or at any level of syntactic representation. Chomsky (1993), on the other hand, talks about situating variation in the morphology, but implements a system in which the key work is done by the features borne by syntactic terminals. Crucially, neither of these approaches winds up having direct implications for the theory of form, as will be seen below.

2.1 What is the *Lexicon*?

As a starting point, some clarifications are required concerning what it means to be *lexical* (and how the *lexicon* relates to morphology). The terms *lexical* etc. are used in so many distinct ways that it is crucial to define precisely what they refer to in a particular context (see e.g. Aronoff 1994, Embick 2015).

Some of the intuitions about what it means to be lexical are relatively simple, and have a long history. One such conception is expressed in Bloomfield (1933), where the lexicon is the repository (=a list) of all that is irregular. When a Lexicon (in a technical sense, hence capitalized) is incorporated into generative grammar in the 1960s, it is connected with Bloomfield's list (Chomsky 1965:87). But this Lexicon also performs other functions. Beyond listing irregularities, it offers ways of analyzing relations among lexical categories (like how the verb *destroy* relates to the noun *destruction*) that were not available in preceding theories; this is the main topic of Chomsky (1970) (for review see Embick 2021). In summary form, a Lexicon of this type does at least two things: it (i) contains words (and lexical rules that relate them) **and** (ii) encodes all of the irregularities in the language as well.

The *and* is stressed immediately above because the conjuncts define two independent functions, and the idea that the grammar contains a Lexicon that handles them both is a hypothesis— one version of what is called the *Lexicalist Hypothesis*. This hypothesis has important consequences for morphological theory. In theories that adopt it in a strong form, all morphology takes place in the Lexicon.¹

The key question for this review is why the Lexicon— where (by hypothesis) **words** are represented— should suggest itself as a natural place to encode **syntactic** variation. The arguments that Borer (1984) and Chomsky (1993) advance on this point are based on what is assumed to be a shared property, and then a reduction. The reasoning goes like this: since form/meaning relations in words (and morphemes) are clearly variable across languages, and thus have to be learned, why not represent the ways in which languages differ syntactically in the same part of the grammar?

Whether this argument feels “conceptually sound” or not depends on a number of factors that could be debated ad nauseam without (in my view) producing any clear conclusions. What is important for present purposes is understanding how it might be implemented. As a basis for this discussion, it is necessary to look further at the distinct functions that are attributed to the 1980s Lexicon (the time of Government and Binding theory; Chomsky 1981 and related work). The two functions identified above as (i-ii) are given as (L1) and (L2). To these I have added a third (L3), which specifies how the words in the lexicon relate to the syntax; this will play a special role in the discussion to come.

(L1) The Lexicon defines a domain that is distinct from the syntax: it is where words are derived and

¹See Carstairs-McCarthy (1992) for a useful review of alternative Lexicalist perspectives.

represented (and thus where morphology happens).

(L2) The Lexicon is where unpredictable form/meaning relations are represented.

(L3) The elements in the Lexicon function as the *terminals* of the syntax.

The L's are separated because while all grammatical theories of the relevant type need to do the things that they specify, there are different ways in which this can be done architecturally. When they are viewed as independent, the links between the encoding of variation and large parts of what falls under morphology are relatively indirect; this will be a main theme of the next section.

2.2 On to syntactic variation

As noted earlier, the idea that syntactic variation can be reduced to the lexicon or morphology emerges from work by Borer (1984) and Chomsky (1993). Although sometimes spoken of together (as the *Borer-Chomsky Conjecture*, see e.g. Baker 2008), some care must be taken to understand what their proposed reductions amount to. On the one hand, they share the intuition outlined above, viz. that syntactic variation should be encoded in a way that is similar to the encoding of other information that must be learned. On the other hand, though, their proposals for how to do this are rather distinct. Borer argues that variation results from rules of a type that may differ from language to language. Chomsky (1993), on the other hand, provides a way of encoding variation in terms of (L3). In this approach, all languages have the same rule system: this is effectively the opposite of what Borer proposes. I will look at each approach in turn.

Borer (1984) Borer develops a theory of the restrictions on possible parametric variation. While often cited as doing this by limiting variation to the lexicon, this is not in fact how her system works. She briefly considers this purely lexical approach (“...the strongest claim...that there are *no* language-particular choices with respect to the realization of universal processes and principles” 1984:2), but rejects it as unworkable. Instead, variation is confined to what are called *inflectional rules*. Their designation suggests a connection with (part of) morphology. In fact, though, their functions are quite broad: abstractly, they are defined as transferring a feature or feature-like element (Case, a Θ -role) from one element to another. They are thus connected both to ‘standard’ morphosyntax (case, agreement, etc.) but also to elements of argument structure (cf. 1984:18-20). The inflectional rules may apply in the Lexicon or at any level of syntactic representation (DS, SS, PF). They are language-particular in the sense that Language 1 may have an inflectional rule that is completely absent from Language 2. To illustrate with one of Borer’s early examples, Lebanese Arabic (1) (from Aoun 1982) allows clitic doubling in prepositional phrases, but Modern Hebrew (2) does not (glosses and transcriptions from source):

- | | | | | | | | | | | |
|-----|----|----------|----------|-----------------------|-------|-----|----|----------|----------|----------------------|
| (1) | a. | ħkit | ma9 | Karim | | (2) | a. | dibarti | 'im | Anna |
| | | talked-I | with | Karim | | | | talked-I | with | Anna |
| | | | | 'I talked with Karim' | | | | | | 'I talked with Anna' |
| | b. | ħkit | ma9-o | | | | b. | dibarti | 'im-a | |
| | | talked-I | with-him | | | | | talked-I | with-her | |
| | c. | ħkit | ma9-o | la | Karim | | c. | *dibarti | 'im-a | (le/šel) Anna |
| | | talked-I | with-him | to | Karim | | | talked-I | with-her | (to/of) Anna |

The parametric difference between these languages reduces, for Borer, to the fact that Lebanese Arabic has an inflectional rule that inserts a case-marking preposition in this context, while Hebrew does not.

The connections between the inflectional rules and inflection in the formal sense, i.e. the theory of inflectional morphemes and their properties, are somewhat remote. The rules have some properties in common with certain conceptions of how inflectional morphology works, but they do not connect to any specific theory of form. Given the focus of this review, it is therefore worth reflecting on what it might mean to call the approach *morphological*. The following quote is instructive:

...[the system] reduces all interlanguage variation to the properties of the inflectional system. The inventory of inflectional rules and of grammatical formatives in any given language is idiosyncratic and learned on the basis of input data. If all interlanguage variation is attributable to this system, the burden of learning is placed exactly on that component of grammar for which there is strong evidence of learning: the vocabulary and its idiosyncratic properties. (1984:29)

Apparently the inflectional rules may be idiosyncratic and language-particular in the same way as grammatical formatives (e.g., the fact that plural is typically /z/ in English). They must comply with universal principles (in particular, the Projection Principle of Chomsky 1981). Beyond this it is not clear what might restrict them. However, this is not one of the main concerns of Borer's book, which focuses for the most part on the idea that these rules apply at different levels of the GB grammar.

A consequence of this approach to variation is that there might be very limited prospects for universals in morphology (including morphosyntax and parts of argument structure). These rules are language-particular and **by definition** how cross-linguistic variation is encoded, meaning that the parts of morphology they touch should be equally idiosyncratic.

This view contrasts rather sharply with what is assumed and argued for in morphological theory, as will become clear in §3. It also contrasts in many ways with Chomsky's (1993) approach, to which I now turn.

Chomsky (1993) The part of Borer's theory that privileges morphosyntax is incorporated into early Minimalism (Chomsky 1993), which (building off of prominent discussions of the syntax of inflection by Pollock (1989), cp. Chomsky (1992)) puts case/agreement interactions at center stage in its mechanics. Variation is spoken of in the following passage:

UG is concerned with the invariant principles of S_0 [=the initial state of the language faculty;de] and the range of permissible variation. Variation must be determined by what is "visible" to the child acquiring language, that is, by the PLD [=primary linguistic data;de]. It is not surprising, then, to find a degree of variation in the PF component, and in aspects of the lexicon: Saussurean arbitrariness (association of concepts with phonological matrices), properties of grammatical formatives (inflection, etc.), and readily detectable properties that hold of lexical items more generally (e.g. the head parameter). Variation in the overt syntax or LF component would be more problematic, since evidence could only be quite indirect. A narrow conjecture is that there is no such variation: beyond PF options and lexical arbitrariness (which I henceforth ignore), variation is limited to nonsubstantive parts of the lexicon and general properties of lexical items. If so, there is only one computational system and one lexicon, apart from this limited kind of variety. (1993:3).

There is a certain amount of unpacking required here. A first point concerns what it means to be *visible*, which is important given the nature of PF, a central concern of this review. There is something very specific intended concerning why variation in **overt** syntax would be problematic. The idea cannot be that 'surface' syntactic differences would create difficulties; it makes little sense to say, for example,

that the difference between e.g. VO and OV word orders would receive only indirect evidence. Rather, the point is that **there is no syntactic variation that involves different syntactic rules**; stated positively, there is one and only one grammatical rule ('computational') system, and it does the same thing in every language. According to this view, it cannot be the case that Language 1 has a grammar in which Rule 1 applies, whereas Language 2 differs because it makes use of Rule 2, where these rules differ in key respects (e.g. in terms of locality properties). Rather, all languages employ the same rules (= 'have the same computational system').

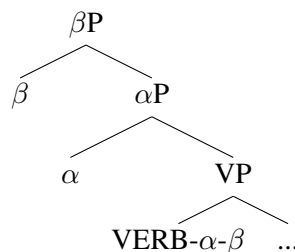
Since languages clearly do appear to differ in their overt syntax, a means of producing differences within this single computational system is required. This is the role that is played by the 'nonsubstantive' parts of the lexicon: features that are (minimally) capable of encoding distinctions along the lines of e.g. 'YP moves to X in Language 1 but not in Language 2' (or that YP moves in the overt syntax in Language 1, but covertly in Language 2), and so on. The core proposal is that these differences are encoded in a restricted way. In the particular implementation proposed in Chomsky (1993), a central role is played by the features of heads like T(ense) and Agr(eement), as well as Case features. Because T, Agr, and case often have morphological reflexes (see below), the loci of variation are spoken of as being lexical/morphological, in the way that is stated in (3):

- (3) Cross-linguistic variation is restricted to ^(a) properties of lexical items, including ^(b) inflectional morphology.

The first part (a) is straightforward. It is quite easy to see what it would mean to talk about syntactic variation in this way if we take *lexical item* as *syntactic terminal* (recall (L3) above). If Language 1 has overt movement in a place where Language 2 does not, this can be reduced to the features of the terminals; as long as these are understood to 'drive' movement, it can be said that Language 1 has a feature that produces movement, while Language 2 does not (or that it has a different value for that feature).

The second part (b) introduces some complexities. Why is 'inflectional morphology' the locus of syntactic variation? The answer in the system that Chomsky develops involves a few steps. The first is the idea that morphology is *pre-syntactic*: it takes place in the Lexicon (cf. §3.1). More specifically, items in the Lexicon (e.g. verbs) are affixed with morphemes via Lexical rules. When this happens, they are simultaneously specified for corresponding features that must be *checked* when they appear in a syntactic derivation. The checking is done via movement (overt or covert) through a hierarchy of functional heads bearing those same features. So, for example, a verb affixed with α and β in the Lexicon must check these features against corresponding heads in a syntactic structure like (4):

- (4) VERB- α - β



The details of this part of Chomsky (1993) have been covered in a number of other places.² What is important for my purposes is how movement in functional heads connects to morphology, i.e. the

²See Marantz 1995 for a synopsis that connects with this paper's themes.

theory of form. Since Chomsky assumes that affixation (=creation of complex forms, which occurs in the Lexicon) is separated from syntax (=movement through functional heads), how is it that morphology defines a locus of cross-linguistic variation?

There are two types of proposals that are meant to address this question, and they differ in terms of whether or not there actually are links with the form side of things. One line of work posits direct connections. Chomsky (1993) employs a notion of feature *strength* that produces overt (strong feature) versus covert (weak feature) movement differences. In the particular area of verb movement, which enjoys a special prominence in that paper, an intense discussion arose concerning possible morphological correlates of feature strength or weakness. This became known as the *Rich Agreement Hypothesis* (cf. Rohrbacher 1999); in short form, the idea that overt morphological distinctions in the verbal paradigm effectively drive syntactic movement, by indicating with morphology that a feature is strong. Putting the details to the side, a compelling line of argument in the literature concludes that the Rich Agreement Hypothesis is false; see Bobaljik (2002) (and for a later attempt to rehabilitate it, Koenenan and Zeijlstra 2014).

The line of research deriving from (3) that continues to receive attention eliminates morphological form from the equation. The resulting theory can be summed up as in (5):

- (5) ONE RULE SYSTEM: There is a single syntactic rule system; syntactic variation reduces to features that are borne by the terminals of syntactic derivations.

In effect, (5) says that there is a way of encoding syntactic variation in syntactic terminals that is essentially neutral with respect to matters of morphological form. The theory is morphological in the sense that it implicates syntactic terminals ((L3) above), which play an important role in Distributed Morphology and other syntactic approaches to morphology, where they are the morphemes. At the same time, the connections between features used to trigger movement etc. and morphological form are at best indirect. By this I mean that the features in question must affect the rule system in ways that produce syntactic variation; it is not clear what expectations there should be (if any) about how they might relate to morphological form.³

2.3 Summary

This section has examined the ways of encoding syntactic variation proposed in Borer (1984) and Chomsky (1993). As foreshadowed at the outset, a point to pay particular attention to is how distinct ONE RULE SYSTEM (5) is from the idea that syntactic variation results from rule-differences across languages, which is part of Borer (1984). The theory centered on (5) holds the syntactic grammar consists of a single rule system, even if what particular languages do with this system might differ substantially in their surface (=overt syntactic) manifestations.

How does this hypothesis relate to the Lexicon and to morphology?

- It relates to the conception of the Lexicon in §2.1 in the way that is connected to (L3). However, it is independent of *Lexicalism* in the technical sense. This means that it is possible to assume that syntactic terminals encode variation without assuming further that there is a single Lexicon that performs the functions (L1-L3) of 2.1.
- Its connections to morphology are indirect. While it is in principle possible for the morphology to be sensitive to the features that are used to encode syntactic variation, it is also possible that the morphology is completely insensitive to them. By itself, (5) is compatible with most if not all conceptions of morphological theory.

³Beyond defining when a complex head is created; see the notions of *complex head* and *affixation* in §3.2 below.

In the light of these conclusions it is worth recalling the intuition that guides the lines of work summarized in this section: viz., that syntactic variation should be encoded in the same part of the grammar as other information that “simply has to be learned.” This idea must be reevaluated in contemporary approaches to morphology that adopt a non-lexicalist view of the grammar, and where the PF interface plays an important role in morphology broadly construed.

3 Universals/Variation: From narrow syntax to PF

In this and the following section I will consider further ways of connecting morphology and comparative syntax, with a focus on the nature of Phonological Form (PF). For immediate purposes, this interface should be understood as the set of computations and representations that begin with a syntactic structure and end in a representation that makes contact with grammar-external systems involved in articulation and perception. In the rest of this paper I will concentrate on two distinct conceptions of PF that have different relations to the study of comparative syntax. The two views of PF differ radically in terms of what this part of the grammar is responsible for. The first, outlined in this section, assigns it a relatively restricted role, with operations dedicated to the phonologization of syntactic objects. The second, which is addressed in §4, makes it responsible for a great deal of what might be thought of as comparative syntax.

To help frame this contrast, it is useful to observe at the outset that there is clearly extensive cross-linguistic variation in this part of the grammar. Basic form/meaning connections differ across languages, as do phonological inventories, phonological alternations, prosodic groupings, and so on. Not all of these loci of variation are of the same type. Some might clearly involve possible universals (e.g. in parts of phonology), while others do not (e.g. how particular Roots or functional morphemes are pronounced in a given language). Part of what I will address in this section is thus where the divisions between the universal and the language-particular might be found in this part of the grammar.

I will center the discussion to come around the two questions (PF1-2) below. Each of these is framed with respect to the observation about variation above; that is:

Given that there are clearly many ways in which languages differ at PF,

(PF1) *where are the dividing lines between the universal and the particular in this part of grammar?
and*

(PF2) *(re-applying the intuition outlined at the beginning of §2), is it possible to reduce apparent syntactic variation to variation at PF?*

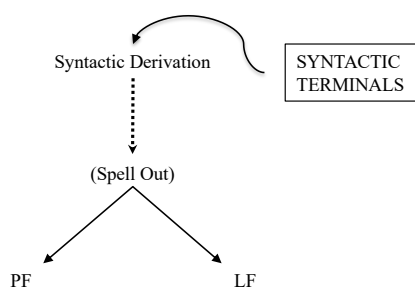
I will address (PF1) in this section, and (PF2) in §4.

As a first step, §3.1 outlines a syntactic approach to morphology, with a particular emphasis on the role that PF plays. In the course of doing this I will identify loci of cross-linguistic variation, along with an outline of what kinds of universals might be expected in going from syntax to PF. This section provides the foundation for §3.2, which provides a case-study from this domain in which languages clearly differ on the surface: the realization of affixation structures. The goal of this illustration is to highlight the level of abstraction at which universals might be sought in the face of obvious cross-linguistic variation. §3.3 presents a summary of main points.

3.1 A syntactic approach morphology

Syntactic approaches to morphology like Distributed Morphology (Halle and Marantz 1993 and related work), which I will outline here, employ the model of grammar schematized in (6):

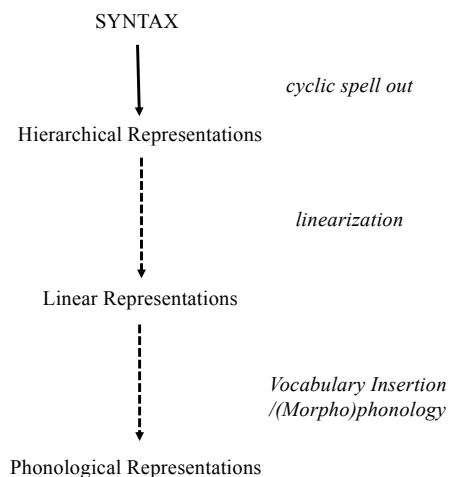
(6) the grammar



The syntax starts with the *syntactic terminals* and builds complex structures with them. In a subsequent step, these structures are spelled out to the interfaces, where they are subjected to further computations that comprise the interfaces with form (PF) and meaning (LF) systems. The important thing to note in connection with §2 is that the grammar in (6) does not contain a Lexicon in which words are derived and represented. Instead, morphology is distributed in the grammar; the analysis of morphological phenomena might thus involve the terminals, the syntax that assembles them into complex objects, and operations at the interfaces.

The view of PF that I will be elaborating on in this section is shown schematically in (7):

(7) PF branch with stages



PF takes the output of the syntax and produces from it a representation that is legible to language-external systems of articulation and perception. The stages in italics in (7) are meant to indicate roles for linearization, Vocabulary Insertion (which provides morphemes with their forms; see below), and (morpho)phonology. Whether there should be more (or fewer) stages like these, and how they should be organized with respect to each other (e.g. serially versus calculated in parallel) is a matter of ongoing discussion. Perhaps the minimum option for *realizational* theories— those that insert phonology after the syntactic derivation— is that PF contain an operation like Vocabulary Insertion that performs this function.

In a theory that distributes morphology in the way described above, possible loci of variation are found in different parts of the grammar: that is, in the syntactic terminals themselves (part of syntax), in the packing of the terminals (the theory of affixation, see below) and in the form/feature connections that are represented in the Vocabulary (part of PF). At the same time, the grammatical operations that apply in morphology broadly construed are expected to be universal– in particular, in terms of their locality properties.

In the next few pages I will give a brief outline of some of the research areas that bear on the universal/variable theme. For an introduction to these topics, see Embick (2015); and for more advanced reviews of specific topics, the papers collected in Alexiadou et al. (to appear).

Syntactic terminals The Syntactic Terminals in (6)– also called *morphemes*– consist of abstract syntactic features: e.g. T+past for the past tense, or #+pl for plural number, or D+def for a definite article. The nature of this feature system is a matter of active ongoing investigation; see Fenger and Kouneli (this volume) and references cited there. A working hypothesis that has been adopted by many is that there is a universally available set of (substantive) syntactic features, subsets of which are active in the grammar of any given language. Thus, certain languages might have features (and thus make distinctions) that are not made in others. One example of this is found in number systems, where some languages clearly show more morphological and semantic numbers than others. As illustration, (8-9) shows personal pronouns from English and Māori (East Polynesian; Bauer 1993). A quick inspection of these tables reveals that there are more distinctions made in the latter than in the former:

(8) English personal pronouns (“nominative”)

p(erson)/n(umber)	singular	plural
1	I	we
2	you	you
3	she/he/it/they	they

(9) Māori personal pronouns

p/n	singular	dual	plural
1 inclusive	au	taaua	taatou
1 exclusive		maaua	maatou
2	koe	koorua	koutou
3	ia	raaua	raatou

So, for example, Māori has a dual number for two participants in addition to singular and plural, while English does not; Māori also distinguishes between inclusive first person non-singulars, where the addressee is part of the group, and exclusive first person non-singulars, where the addressee is not. Focusing on the first of these contrasts, an encoding along the following lines suggests itself. First, for English, it suffices to say that Number morphemes possess a single binary feature like $[\pm\text{plural}]$, where the negative value is for singulars, and the positive for plurals. Then, for a system like the one in Māori, two binary features are required, along the lines shown in (10) (see Noyer 1992, Harbour 2007 and related work for more details):

(10) Features of Number morphemes

	-pl	+pl
+sg	“singular”	--
-sg	“dual”	“plural”

Stated in terms of (10), the inventory of syntactic terminals in Māori has a dual morpheme [-sg,-pl] that is absent in English, which has only [-pl] (“singular”) and [+pl] (“plural”).

Given the architecture in (6) and the view of the morpheme that it connects with, I will use the terms *syntactic features* and *morphological features* interchangeably below, even if there are some cases in which this might be an oversimplification (e.g. if there are ‘purely morphological’ features; e.g. for conjugation or declension class).

In summary, the syntactic terminals might differ cross-linguistically, but by hypothesis this is constrained by there being a single inventory of features that make up possible morphemes. Beyond the functional morphemes so defined, another type of terminal that appears in syntactic structures is clearly highly variable across languages. These are the *Roots*, members of the non-functional vocabulary like $\sqrt{\text{CAT}}$, or $\sqrt{\text{RAIN}}$. Finally, this framework could (but does not have to) incorporate the hypothesis that syntactic variation is encoded in another type of feature system in the functional morphemes, along the lines of what is described in §2. Introducing such features would produce further ways in which syntactic terminals might differ cross-linguistically.

The Vocabulary Above I used the term *abstract* when introducing the syntactic terminals and their features. The meaning of this is that the morphemes are hypothesized to be purely syntactic objects: they consist of features that are interpreted for form (at PF) and meaning (at LF), but only acquire their forms and meanings when the syntax is interpreted at the interfaces; see Embick (to appear) for review. On the PF side, morphemes undergo a process called *Vocabulary Insertion* that provides them with phonological content. To take an example, the Latin past tense morpheme T[+past] is realized with the exponent *-bā* in the Imperfect: *laud-ā-bā-mus* ‘we were praising’. In the perfect aspect, however, it is realized as *-rā*; cp. pluperfect *laud-ā-ve-rā-mus*. This effect– (*contextual*) *allomorphy*– is analyzed with the following *Vocabulary Items*:

(11) Vocabulary Items for T[+past]

T[+past] ↔ -rā/Asp[perf]__
T[+past] ↔ -bā

These Vocabulary Items compete for application to T[+past], with the most specific one winning. Thus *-rā* is found whenever T[+past] is local to the perfective head; otherwise *-bā* appears.

The set of all Vocabulary Items is referred to as the *Vocabulary*. It goes without saying that the Vocabularies of different languages simply need to be learned, and are therefore highly variable. When Roots are taken into account, the variability increases. At the same time, there are aspects of Vocabulary Insertion that have been proposed to be universal. One concerns the *order* in which Vocabulary Insertion applies: it has been argued that it occurs ‘inside-out’ in hierarchical structures; see Kalin and Weisser (to appear) for discussion. A second concerns locality; I turn to this next.

Locality In a theory with abstract morphemes, the form of a morpheme may be affected by the presence of morphemes around it, as illustrated in (11) above. Thinking about this kind of contextual effect in terms of operations that apply to morphemes, one of the central questions for this part of grammatical theory therefore concerns how local contexts are defined; viz., *what is the theory of locality that determines which elements in its context a morpheme may be influenced by for form?* Given (6) and (7) there are different types of locality conditions that could in principle play a role in this domain.

In the rest of this section I will present some of the relevant types of locality conditions that have been explored in the literature, with two purposes in mind. First, on the universals theme, it is generally agreed on that grammars should not differ in locality conditions. While there ongoing debates on many

questions, the basic assumption in this type of research is that the same locality conditions apply in all languages. The second purpose touches on where languages vary. While languages might show exactly the same locality conditions in “morphophonology in the broad sense,” they differ substantially with respect to how much they make use of different operations that are universally defined. The result of this is that languages may differ significantly in how the same syntactic structure is realized as PF; this is focus of the illustration that is given in §3.2 below.

In outline form, the following three types of locality conditions have been investigated in morphology:

(Phase) cyclic locality. If syntactic structures are interpreted at the interfaces in a way that involves *phases*, as in Chomsky (2000, 2001) and much subsequent work, then the phase provides one type of domain for local interactions (Marantz 2001, 2007, 2013 Embick and Marantz 2008, Embick 2010a). In its simplest form, the idea would be that two morphemes can interact at an interface when they are both active in the same phase. See Embick (2021) and Ingason (to appear) for reviews.

Hierarchical locality. The hierarchical structures generated by the syntax provide a way of defining local domains in which syntactic terminals can interact. Examples from the literature involve interactions that take place only when a particular command relation is met (e.g. *c-command*), or when terminals are in a privileged configuration (e.g. sisterhood, or “sharing a non-terminal node”). See e.g. Adger et al. 2001, 2003, Borer 2013, and related work.

Linear locality. The terminals of syntactic structures are realized in a linear order, as are the phonological segments comprising the exponents of morphemes. It has been proposed that both linear relations between morphemes and linear relations in phonological representations (autosegmental tiers) play a role in morphophonological phenomena. See e.g. Embick (2010a) and related work.

Although presented separately above, a key idea in the literature is that certain phenomena might be the result of more than one of these conditions interacting. For example, the treatment of allomorphy in Embick (2010a) proposes that two morphemes see each other only when (i) they are active in the same phase-defined domain, and (ii) they are immediately linearly adjacent. On the point (ii), another line of research proposes that morphemes may interact when they are hierarchically adjacent; i.e., when no morpheme appears between them structurally (see the references above).

It is not my intention to examine or motivate each of these types of locality here; see Embick (to appear) for discussion and references. Rather, the point of highlighting locality is that it concentrates attention on the kind of **abstraction** that is required in talking about potential universals. While the Vocabularies of different languages are clearly quite different, the strongest hypothesis is that there are nevertheless universal principles governing form/meaning connections. In the particular example just outlined, this means a theory of locality that determines when morphemes may (and may not) see each other for allomorphy.

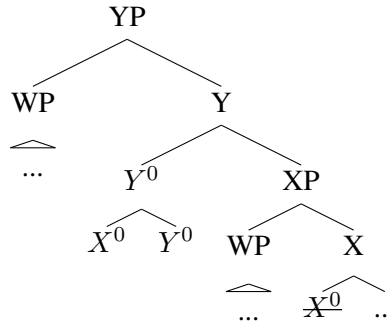
The next section provides a specific illustration of the abstraction theme, with a particular focus on how languages differ in the realization of affixation structures.

3.2 Illustration: Affixation/realizing affixed structures

Immediately above I talked about locality in connection with the realization of morphemes at the PF interface. But there are, of course, other areas in which considerations of locality play a role in morphology broadly construed. One of these is the theory of affixation. Most theories of the syntax/morphology

interface recognize a notion of *morphosyntactic word*, in which syntactic terminals are “closer” than they are in typical phrasal structures. The operation of Head Movement, for example, is conceived in this way; it produces an adjunction structure by attaching one head to another to form a *complex head*, in the manner shown in (12):⁴

(12) Head Movement of X^0 to Y^0



The version of head affixation schematized in (12) has been the subject of intensive investigation. At the same time, various approaches have moved away from the idea that all complex head formation is the result of upwards Head Movement. In one direction, there is the idea affixation can be both upwards and downwards in hierarchical terms, something that comes close to what is called *Morphological Merger* in Marantz (1984,1988); see for example Embick and Noyer (2001), who posit a PF operation called *Lowering* that can affix Y to X in (12). A related line of work hypothesizes that linear relations among morphemes define certain types of affixation at PF; this is called *Local Dislocation* in Embick and Noyer (2001); see also Embick (2007). Some more recent proposals have generalized the idea that a single operation applies to heads in an “extended projection” (Grimshaw 2005) such that they may be realized in an affixation structure, with the complex head being pronounced either “high” or “low”– see Arregi and Pietraszko (2021) for such an approach (they also make use of a linear mechanism).

The aspect of affixation that I will elaborate on in the rest of this section illustrates the universal/variation theme that runs throughout this paper. For the universal part, it is generally assumed that the locality conditions restricting affixation are invariant, even if the details of the relevant operations continue to be actively debated. At the same time (i) the extent to which particular languages create affixation structures is subject to extensive variation; and (ii) the ways in which affixed structures are realized also differs substantially across languages.

Beginning briefly with (i), there are many cases in which clauses that are realized as multiple heads (=analytically) in one language are realized as a single complex (=synthetically) in another.⁵ Some examples from Latin and Yoruba illustrate in (13-14):⁶

(13) Latin

- a. Rēgīna **laudābātur.**
 rēgīna laud -ā -bā -tur
 queen.NOM praise TH PAST 3S.PASS
 ‘The queen was being praised.’

⁴See, for example, Koopman (1984), Travis (1984), and Baker (1985,1988) for early formulations and applications.

⁵For further discussion Fenger (2020), Bjorkman (to appear), and references cited there.

⁶Glosses: ACC = Accusative; DUR = Durative; NOM = Nominative; PASS = Passive; PERF = Perfect; PROG = Progressive; TH = Theme.

- b. Nautae rēgīnam **laudāverant.**
 nautae rēgīnam laud -ā -ve -ra -t
 sailors.NOM queen.ACC praise TH PERF PAST 3PL
 ‘The sailors had praised the queen...’
- c. Rēgīna **laudāta est.**
 queen laud -t -a est
 queen.NOM praise PART FEM.SG BE.3SG
 ‘The queen was/has been praised.’

(14) Yoruba (from Bode 2000)

- a. Bode **n fo** ife funfun.
 Bode PROG wash cup white
 ‘Bode is/was washing white cups.’
- b. Bode **máa n fo** ife funfun.
 Bode DUR PROG wash cup white
 ‘Bode washes white cups.’
- c. Bode **ti n fo** ife funfun.
 Bode PERF PROG wash cup white
 ‘Bode has been washing white cups.’

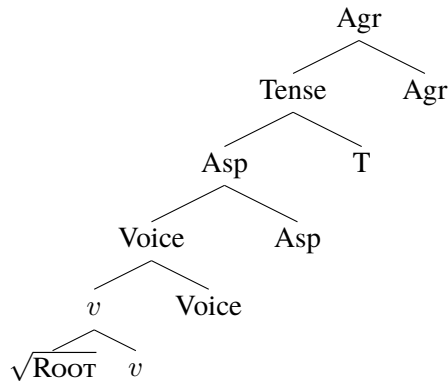
An examination of the Latin and Yoruba examples and their corresponding English translations reveals numerous ways in which essentially the same types of morphemes are affixed (or not) in different ways. For example, the affixed Latin pluperfect in (13b) corresponds to the auxiliary *had* and a past participle *praised* in English; note that within Latin the passive equivalent (13c) shows an auxiliary and a participle, i.e. a different affixation pattern from the synthetic active. For a second comparison, Yoruba progressives like (14a) have unaffixed *n fo* corresponding to affixed *washing*; the perfect of the progressive (14c) adds another unaffixed morpheme on top of this. Generally speaking, the point is that languages display different amounts of affixation within similar or identical clause structures.

The goal of the remainder of this section is to look at (ii), how synthetic forms are realized. The specific point in focus concerns the extent to which languages employ “affixal” and “non-affixal” means to express syntactic features. The differences that languages show in this part of the grammar highlights the question of how abstract possible universals might be.

The data I will draw on involve verb forms from a variety of different languages that make the same or similar distinctions in terms of Tense, Aspect, Agreement, and so on. I take this to mean that these verbs are formed in the same types of clauses, in affixation structures of the type in (15). Although not all of these heads are necessarily present in all of the verb forms seen below, (15) suffices to illustrate the main point I wish to highlight:⁷

(15) verbal structure

⁷Whether all of the languages to be examined employ the same operation(s) to derive the schema in (15) is not what is at issue; most likely they do not. This does not affect my main point about how structures are realized, though.



As we can now see, even a casual look at the data from several languages in (16-21) reveals substantial differences in how structures like (15) are realized morpho(phono)logically:⁸

(16) Some forms of Turkish *git* ‘go’

p/n	past	conditional	future	aorist
1s	gittim	gitsem	gideceğim	giderim
2s	gittin	gitsen	gideceksin	gidersin
3s	gitti	gitse	gidecek	gider
1p	gittik	gitsek	gideceğiz	gideriz
2p	gittiniz	gitseniz	gideceksiniz	gidersiniz
3p	gittiler	gitseler	gidecekler	giderler

(17) Some forms of Latin of *amō* ‘to love’

p/n	present	future	imperfect	present subjunctive
1s	amō	amābō	amābam	amem
2s	amās	amābis	amābās	amēs
3s	amat	amābit	amābat	amet
1p	amāmus	amābimus	amābāmus	amēmus
2p	amātis	amābitis	amābātis	amētis
3p	amant	amābunt	amābant	ament

(18) Icelandic *brot* ‘break’ (transitive)

p/n	<i>Indicative</i>		<i>Subjunctive</i>	
	<i>present</i>	<i>past</i>	<i>present</i>	<i>past</i>
1s	brýt	braut	brjóti	bryti
2s	brýtur	brautst	brjótir	brytir
3s	brýtur	braut	brjóti	bryti
1p	brjótum	brutum	brjótum	brytum
2p	brjótið	brutuð	brjótið	brytuð
3p	brjóta	brutu	brjóti	brytu

⁸Turkish (Turkic), Kornfilt (1996); Latin (Italic, Indo-European), Leumann et al. (1963); Icelandic (Germanic, Indo-European), Wood (2015), Ingason (2016); Tlatepuzoc Chinantec (Oto-Manguean), Baerman and Palancar (2014); Dinka (Western Nilotic), Andersen (1992,1993); Maltese (Semitic), Hoberman and Aronoff (2003).

(19) Tlatepuzco Chinantec *húʔ³²* ‘break’

p/n	present	future	past completive
1s	<i>húʔ³²</i>	<i>húʔ³¹</i>	<i>ka³húʔ³</i>
2s	<i>húʔ³²</i>	<i>húʔ³¹</i>	<i>ka³húʔ³</i>
3s	<i>húʔ²</i>	<i>húʔ²</i>	<i>ka³húʔ²</i>
1p	<i>húʔ³²</i>	<i>húʔ³¹</i>	<i>ka³húʔ³¹</i>
2p	<i>húʔ³²</i>	<i>húʔ³¹</i>	<i>ka³húʔ³</i>
3p	<i>húʔ²</i>	<i>húʔ²</i>	<i>ka³húʔ²</i>

(20) Some Dinka verb forms: (a) *lèer* ‘roll’; (b) *ɲàaɲ* ‘open’; (c) *còɔl* ‘call’

p/n	(a)	(b)	(c)
1s	<i>lɛ̀ɛ̀ɛ̀r</i>	<i>ɲààɲ</i>	<i>caàal</i>
2s	<i>lêer</i>	<i>ɲáɲ</i>	<i>còɔl</i>
3s	<i>leèer</i>	<i>ɲɛ̀ɛ̀ɛ̀ɲ</i>	<i>còɔl</i>
1p	<i>lèerkú</i>	<i>ɲàaɲkú</i>	<i>còɔlkú</i>
2p	<i>lèerká</i>	<i>ɲàaɲká</i>	<i>càalká</i>
3p	<i>lèerké</i>	<i>ɲàaɲké</i>	<i>còɔlké</i>

(21) Maltese Verbs: (a) ‘break’; (b) ‘build’; (c) ‘be absent’; (d) open; (e) ‘download’

a. Perfect

p/n/(g)	(a)	(b)	(c)	(d)	(e)
1s	<i>ksirt</i>	<i>bnejt</i>	<i>fallejt</i>	<i>ftaħt</i>	<i>iddawnlowdjajt</i>
2s	<i>ksirt</i>	<i>bnejt</i>	<i>fallejt</i>	<i>ftaħt</i>	<i>iddawnlowdjajt</i>
3s.m	<i>kiser</i>	<i>bena</i>	<i>falla</i>	<i>fetaħ</i>	<i>iddawnlowdja</i>
3s.f	<i>kisret</i>	<i>bniet</i>	<i>falliet</i>	<i>fethet</i>	<i>iddawnlowdjat</i>
1p	<i>ksirna</i>	<i>bnejna</i>	<i>fallejna</i>	<i>ftaħna</i>	<i>iddawnlowdjajna</i>
2p	<i>ksirtu</i>	<i>bnejtu</i>	<i>fallejtu</i>	<i>ftaħtu</i>	<i>iddawnlowdjajtu</i>
3p	<i>kisru</i>	<i>bnew</i>	<i>fallew</i>	<i>ftaħu</i>	<i>iddawnlowdjaw</i>

b. Imperfect

p/n/(g)	(a)	(b)	(c)	(d)	(e)
1s	<i>nikser</i>	<i>nibni</i>	<i>nfalli</i>	<i>niftaħ</i>	<i>niddawnlowdja</i>
2s	<i>tikser</i>	<i>tibni</i>	<i>tfalli</i>	<i>tiftaħ</i>	<i>tiddawnlowdja</i>
3s.m	<i>jikser</i>	<i>jibni</i>	<i>jfalli</i>	<i>jiftaħ</i>	<i>jiddawnlowdja</i>
3s.f	<i>tikser</i>	<i>tibni</i>	<i>tfalli</i>	<i>tiftaħ</i>	<i>tiddawnlowdja</i>
1p	<i>niksru</i>	<i>nibnu</i>	<i>nfallu</i>	<i>niftħu</i>	<i>niddawnlowdjaw</i>
2p	<i>tiksru</i>	<i>tibnu</i>	<i>tfallu</i>	<i>tiftħu</i>	<i>tiddawnlowdjaw</i>
3p	<i>jiksru</i>	<i>jibnu</i>	<i>jfallu</i>	<i>jiftħu</i>	<i>jiddawnlowdjaw</i>

The analysis of any one of these languages raises questions of segmentation, i.e., concerning how many discrete pieces are found in these phonological forms, and how these pieces relate to the terminals in (15). The forms in (18-21) show alternations in the verb ‘stem,’ and highlight the question of how the grammar brings about what is called *morphophonology in the narrow sense*: informally speaking, phonological changes that express or are associated with morphological features. For example, the Future in Turkish is signalled by the discrete exponent *-ecek* in (16). In Tlatepuzco Chinantec (19), on the

other hand, there is no concatenated affix associated with the Future; instead, there is a tonal difference on the verb itself, as can be seen in comparison with the Present and Past Completive forms. Or, while in the Latin present subjunctive, this mood is signalled by a suffix *-ē* that occurs between the verb and agreement, the present subjunctive in Icelandic appears to be marked by alterations to the verb (along with some differences in the realization of agreement).

The kinds of variation seen in the examples above provides a good illustration of the idea that universals must be sought at an appropriate level of abstraction. Building on the prior discussion in this section, I will develop this point in a few steps. To start with, the syntactic terminals appearing in structures like (15) are drawn from the universal feature inventory in the way outlined in §3.1. These morphemes appear in hierarchical structures that are in many cases universal as well (e.g. Tense is higher than Aspect, Aspect appears above *vP*, and so on).⁹ Further, the operation(s) producing affixation structures are by hypothesis universal as well, as described above. Finally, the exponents inserted by Vocabulary Insertion are obviously different in the languages in (16-21). As outlined earlier, though, the principles governing Vocabulary Insertion that determine e.g. order of application and possible allomorphic interactions are hypothesized to be universal.

Beyond these observations, the question to be asked now is what kinds of universals might be posited in talking about morphophonology; i.e., the appearance of various types of apparently non-affixal morphological realizations in (18-21) in particular. In short form, the overarching question is how many PF-mechanisms the grammar employs that are directly sensitive to morphological features. Two opposing positions on this question are stated in (22):

- (22) EXPONENCE QUESTION: Does the grammar use only Vocabulary Insertion to realize syntactic features? Or does the grammar also effect phonological changes that are triggered by morphological features (or apply only to certain morphemes, and not others)– i.e. is there *morphophonology*?

For ease of reference, the former option will be referred to as VIO (=“Vocabulary Insertion Only”); and the latter as MP (=with “MorphoPhonology”).

The EXPONENCE QUESTION is the current incarnation of a long-standing controversy in morphological theory. A lengthy debate starting in the middle of the 20th century concerns whether morphology is based on *pieces* or on *processes* (see e.g. Hockett 1954). The original framing of Distributed Morphology in Halle and Marantz (1993) is directed at this question: it argues for a piece-based view against an “amorphous” alternative developed by Anderson (1992). However, though centered on pieces, Halle and Marantz ultimately argue for a ‘split’ view of morphological realization. Vocabulary Insertion targets morphemes in the manner described in §3.1. In addition to this type of exponence, part of the phonological grammar is directly sensitive to morphological features or particular Roots, and makes morphophonological changes in a way that refer to these.¹⁰

To illustrate, consider English $\sqrt{\text{SING}}$, with present *sing* and past tense *sang*. The analysis of this kind of past tense form in Halle and Marantz (1993) involves first, a null exponent of the T+past head; and second, the application of a morphophonological rule or rules that are triggered when $\sqrt{\text{SING}}$ is in the context of T+past. These rules (or their equivalent) change the vowel nucleus in the appropriate way. Halle and Marantz are at pains to show that Vocabulary Insertion and morphophonology are distinct;

⁹For the qualification to *many cases*: the position of Agreement morphemes often varies across languages; as does the realization of Voice morphology.

¹⁰This move builds on an earlier literature that examines various ways of making the phonology sensitive to morphology. A more exhaustive review could trace the path from Chomsky and Halle (1968) through Lexical Phonology and Morphology (Kiparsky 1982) to the idea that particular morphemes bear diacritics visible to the phonology in Halle and Vergnaud (1987) as a background to the works cited in the text.

this is one way of distinguishing the predictions of their piece-based approach from the predictions of Anderson's theory.

More recently, the continuation of the view argued for by Halle and Marantz analyzes morphophonology in similar terms, with part of the phonology being able to see morphological features and Roots; see Embick and Shwayder (2018) for a recent development of this kind of theory. At the same time, other research programs reject MP outright, or employ other mechanisms to reduce its scope; see e.g. Lieber (1987,1992), Bye and Svenonius (2012), Haugen and Siddiqi (2016), Caha (to appear) and Newell and Ulfsgjorninn (2021) for different approaches and pertinent discussion.

The different works cited in the last paragraph above put forth a number of different possible analyses of stem changes, both MP and VIO. For many of the phenomena that have been examined in the literature, it looks like there are both plausible analyses in terms of both VIO and MP (see Embick 2010b). Take *sang*, for which an MP analysis is sketched earlier. A VIO alternative might say that *sang* realizes both $\sqrt{\text{SING}}$ and T+past; or, that what is inserted at T+past in the context of $\sqrt{\text{SING}}$ is a set of features that produce a vowel change in the phonology. The question is thus what kinds of evidence might be appealed to in support of either MP or VIO at the expense of the other.

Some arguments of this type can be found in the literature. For example, Halle and Marantz (1993) present an argument based on *blocking effects* that is directed at Anderson (1992), but also applies to many VIO analyses that have been proposed in the literature (see Embick 2016). However, different MP and VIO theories continue to be actively compared, in a literature that appears to be gaining momentum.

For my purposes in this paper, the point to focus on is the relation between the general and the particular. Which is to say, particular analyses of morphophonological alternations quickly become enmeshed in thorny details of all kinds; especially in more complex systems, e.g. (18-21) compared to the relatively impoverished system of English verb stem alternations. At the same time, the analyses of such systems directly implicates the quite general EXPONENCE QUESTION (22), which asks a basic question about how the form interface interprets syntactic structures. Thus, while the details of any worked out morphophonological analysis might appear to be quite language-specific, analyses of this type can potentially be brought to bear on the EXPONENCE QUESTION (22), which is large in scope and importance. The trick in trying to answer it is (as always) developing the analysis of a particular system into an empirical argument for (or against) VIO or MP. Crucially– and this is the main point of this illustration– this question (and hence the possible universal it addresses) are stated at a very abstract level relative to what might be seen in any particular language.

3.3 Summary

The PF component plays an important role in syntactic approaches to morphology. This section looks at the question of what could be universal in the syntax-to-PF part of the grammar. Since there is obvious cross-linguistic variation in phonological form broadly construed, a primary point of the outline in §3.1 and the illustration in §3.2 is that possible universals are expected to be relatively abstract; i.e., not always visible to the same degree “on the surface” in every language. I do not think that this point is particularly profound, but it deserves emphasis given the frequently encountered idea that PF (or morphology in general) are by definition or inherently variable.

Another large theme running throughout the line of work summarized above is that what PF is responsible for is relatively limited in scope. This restricted view of the interface with form contrasts sharply with an alternative conception that is the topic of the next section.

4 PF: Variation and “externalization”

The focus on PF in the last section invites a discussion of what is called *externalization* in recent discussions within the Minimalist program. Inquiry of the relevant type concentrates on the *Core Computational System* (CCS), understood as narrow syntax. The term *externalization* refers to the idea that an interface— i.e., PF— is required to connect the CCS with sensorimotor cognitive systems *outside* of language; see e.g. Berwick and Chomsky (2011), Chomsky (2011). In short form, the CCS must make contact with systems involved in articulation and perception (AP), systems that employ a “vocabulary” that is distinct from that involved in language. So, for example, the interface must take objects like morphemes (i.e. syntactic terminals, and the structures they appear in), and relate these to phonological features; these linguistic representations must then connect with phonetic realization, which operates in completely distinct terms (e.g. in terms of articulatory gestures).

The hypothesis to be examined in this section is that cross-linguistic variation of all types— including apparent syntactic variation— is a consequence of externalization, and not part of syntax proper (Chomsky 2019). I have stated this as (23), although as will be seen shortly this statement will need to be elaborated on in various ways:

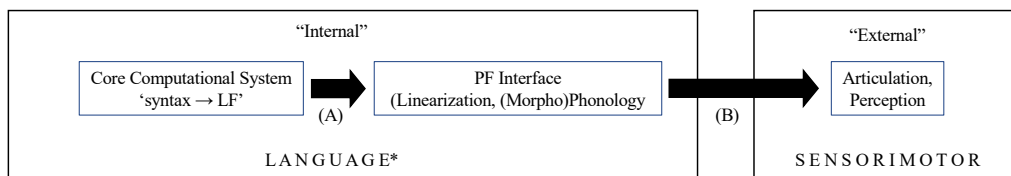
- (23) EXTERNALIZATION HYPOTHESIS: Cross-linguistic variation arises due to externalization; there is no variation in the CCS.

Since PF is the domain of morphophonology in a theory like the one outlined §3, the idea in (23) amounts to a further way (beyond §2) in which apparent syntactic variation might be reduced to “morphology;” which is to say, another way of locating syntactic variation in a part of the grammar that must encode various types of language-specific information.

Before I proceed, a disclaimer is in order. The literature discussing externalization is complex, and could be taken in different directions. The path that I have chosen here chooses only one of these, concentrating exclusively on (23) and an attendant view of PF that contrasts with that of §3.

There are some steps to take on the way to understanding (23). First, it is helpful to distinguish two ways in which the term *externalization* can be used. One is as a **requirement**: viz., that the CCS connect with language-external cognitive systems. The second is to designate the language-internal **system** that meets this requirement: i.e., PF. Though not part of the CCS, PF has to be part of language in the broad sense because it interprets (manipulates and operates on) symbolic representations (syntactic features, phonological features) that are language-specific. Schematically, I take these points as positing the system in (24):

- (24) Externalization, schematically



* “Faculty of Language in the Broad Sense”

(A) Interface motivated by Externalization

(B) Externalization proper

The goal of this section is to ask what it would mean to reduce all variation to externalization. Questions of this type are (as it were) internal to a particular kind of Minimalist perspective, one that is often difficult to connect with the kinds of empirical arguments that are at the center of much work in theoretical linguistics.¹¹ For this reason, one of my primary tasks will be to connect questions about externalization with specific hypotheses that might be tested.

An important premise involved in discussions of externalization is that the CCS operates with hierarchical structures. The linear relations that are ultimately derived from these are of no importance to it; they are required only because the performance system(s) connected to the CCS operate in real time. As such, linear relations are not part of the narrow syntax (cf. 24), a position that extends a long line of reasoning on “structure dependence” in syntax (cf. Chomsky 1968).

For the discussion to come, it is useful to have a shorthand way of referring to two distinct ways in which linear relations are implicated in syntax broadly construed. One of these is the one just outlined—the idea that syntactic objects are purely hierarchical, and thus must be linearized; this I will call *LIN*. A second notion, which I refer to as *IS*, concerns meaning (understood in a very broad sense). This is the idea that the linear effects are often used to produce particular kinds of interpretive effects (theme/rheme, topic/comment, figure/ground ...) that can be referred to as aspects of *Information Structure*:

LIN: The mere fact that syntax must be realized in a linear order.

IS: The fact that linear order may be exploited to produce various interpretive effects (I(nformation) S(tructure)).

With these notions at hand, the rest of this section examines two ways in which externalization has been linked to syntactic variation.

The first one, which is centered on IS, introduces important general concepts that will be of use throughout this section. A line of reasoning found in parts of Chomsky’s early writings on Minimalism holds that the PF component does more than what is outlined above in §3. In particular, it has the ability to displace elements (phrases etc.), in a way that is responsible for a great deal of cross-linguistic variation. The basic claim is that displacement operations that produce linear IS effects are not part of the CCS. Rather, they are brought about in “some additional level or levels internal to the phonological component, postmorphology but prephonetic, accessed at the interface along with PF...and LF...” (Chomsky 1995:220). Though typically introduced in asides, this level (or set of levels) plays an important role in the framework, by essentially providing a negative boundary: they stand “outside” of core Minimalist inquiry, and are not expected to conform to the same principles that apply to the CCS (Chomsky 1995:325). Speaking informally, the result is an architecture with what could be thought of as two syntactic systems (or two displacement systems): one core, the CCS; and another movement-producing system that is part of PF, and can thus be called *PF-syntax*. Notice that this conception of PF and movement goes far beyond the much more limited view that some affixation operations happen at PF (recall §3.2); in the limit (as will be seen below) it might mean putting most or all of what is typically thought of as syntax into the PF component.

Positing a PF-syntax is a significant move, and thus requires substantial motivation. Providing evidence for or against this claim amounts to answering the question stated in (25):

- (25) TWO SYNTAX QUESTION (TSQ): Does the grammar contain two qualitatively distinct displacement systems (i.e. a PF-syntax that is distinct from the CCS)?

¹¹For an enthusiastic discussion of why this might be the case see Hornstein (2018,2019).

It should be clear in the context of the present paper what is at stake with (TSQ): if it receives an affirmative answer, then it would be possible to explore the hypothesis that PF-syntax is responsible for many types of putatively syntactic variation, with the CCS being uniform (i.e. invariant). I will return to the question of what *invariance* might look like below.

There are in principle some different ways in which work on the (TSQ) might proceed. Stated abstractly, the goal would be to demonstrate that there are two qualitatively distinct types of displacement in language: one that is part of the CCS, with one set of properties; and another that is part of PF, subject to e.g. distinct locality conditions, or something along those lines. Another kind of reasoning is based on ordering. In the assumed architecture, the CCS operates prior to PF and PF-syntax. It might then be possible to examine two types of movement (more generally, two different operations), one hypothetically in the CCS, and one at PF– to see if they interact in ways that are expected or unexpected given the hypothesized ordering.¹²

In spite of the interesting possibilities suggested above– and perhaps somewhat surprisingly given the provocative nature of the core claims at hand– there does not appear to be a great deal of empirical work that concentrates on (TSQ) per se.¹³ I think that there are more or less two reasons why this might be the case. In one direction is the response to (TSQ) among many practicing researchers, which has been, for the most part, to ignore the hypothesized core-syntax/PF-syntax split, and treat apparently syntactic phenomena as they were treated in earlier theories, i.e. as part of the syntax proper. This means effectively that such work either concludes (or assumes) that there is no qualitative distinction between two types of displacement along the lines posed in (TSQ)– or that, if there is, the domain of core-syntax is larger than it might be according to Chomsky’s conception, rendering a hard focus on (TSQ) unnecessary.

The ‘dividing line’ question brings us to the second reason alluded to above; this one implicates a more recent move, which takes essentially all apparent syntactic variation to be part of PF. Later work by Chomsky, which develops the *Strong Minimalist Thesis*, seems to take the correctness of the ‘two syntax’ hypothesis for granted, and posits an even more robust role for PF in understanding why languages look as they do (cf. Chomsky 2019). This line of work places special emphasis on the idea that the CCS is optimized for the LF interface. The most extreme hypothesis building on this idea is that languages do not vary in this part of the grammar at all; that is, there is a single syntax-to-LF CCS that they all share. Differences among languages arise due to LIN; which is to say, at PF, because of the requirement that syntactic structures be externalized.

To understand what this might mean, it is useful to revisit the idea from §2 that there is a single CCS; recall ONE RULE SYSTEM, repeated here as (26):

- (26) ONE RULE SYSTEM: There is a single syntactic rule system; syntactic variation reduces to features that are borne by the terminals of syntactic derivations.

As pointed out in §2, languages may differ syntactically and still conform to (26). The idea that languages are syntactically identical is stronger than this; it removes all variation from the picture:

- (27) SYNTACTIC IDENTITY: All languages are identical for NS → LF.

¹²The kind of reasoning described here has been examined with reference to some specific topics. For example, Chomsky (2001) on what he calls *ThEx*, the interaction of expletive *there* in passivization with *wh*-movement. Another line of work has discussed interactions with affixation; see Embick (2000) with reference to “optional” movement with affixation; and Saab (2022) and references cited there for connections with ellipsis in addition to affixation-related movement.

¹³Though see Bennett et al. (2016) for an important contribution (and for references to work examining the role of phonology in word-order effects). One thing to keep in mind in work on syntax/phonology connections is that if a phenomenon shows sensitivity to phonology, it does not necessarily follow that the operations that derive it are part of the phonological component. This is one of the things that makes research on the (TSQ) challenging.

According to this view, the CCS produces argument/event structures, temporal and aspectual properties, clausal types, operator/variable structures, etc. in a way that is completely invariant across languages. It follows that essentially all of the subject matter of comparative syntax— the ways in which languages appear to differ syntactically— is not syntax at all. Rather, it is derivative of LIN (and IS), which is to say, it is PF syntax, in an extension of the way that I used this term above.

Before thinking about what this might mean for PF, it bears emphasizing that it is not entirely clear what it means for LF. For example, in its strongest form (27) would presumably require languages to be identical in their syntactic terminals. How this position can be maintained in light of clear differences in inventories (recall the discussion of number in English and Māori in §3) is not at all clear. Some care must therefore be taken to specify in further work exactly the scope of (27); that is, precisely what NS→LF computations look like such that they could be invariant across languages.

Turning now to the form side, the difference between the conception of PF-syntax arising from (27) and the IS-centered one examined earlier in this section is a matter of degree. The first view takes IS-relevant displacements (and perhaps other operations) to be part of PF. The second view takes all apparently syntactic differences to take place there. Some of Chomsky's comments on what this might mean connect closely with "standard" topics in linearization, viz. those associated with the "Directionality Parameter" in earlier work (see Ch.2 for some discussion). So, for example, if one language is OV and another VO, then all else equal (and there is a real question as to how often it is), this could be transparently treated as the same syntactic object [V DP] being linearized in two different ways. However, linearization differences cannot be the whole story, even when we restrict attention to something like basic word-order properties— more is required to derive the differences between SVO, SOV, VSO, and VOS languages, meaning that various types of IS-irrelevant movement must take place at PF. The consequences of (27) are thus potentially quite extreme: if it is correct, then almost all of what has been studied in theoretical syntax is actually not syntax at all, but PF-syntax; which is to say, side-effects that are produced when syntax is externalized due to LIN. As Chomsky (2019) pithily notes, if correct it leads to the "paradoxical conclusion" that "... just about everything that's been studied in linguistics for the last 2500 years is not language. It's the study of some amalgam of language and sensory-motor systems."¹⁴

Though the discussion of this section has been by necessity somewhat abstract, the questions that are at issue are potentially of fundamental importance for comparative syntax: in effect, what is at issue is whether there is real syntactic variation or not. In the latter scenario— where (27) holds— there is only the study of how the CCS interacts with externalization, essentially comparative PF. Importantly, the kinds of arguments that could provide evidence for or against (27) have already been pointed to: they can be derived from (TSQ) above. The need for empirical work probing (TSQ) for work adopting (27) (or the assumptions from which it derives) is thus quite pressing.

On this last point, the question at issue is a standard one; asking, given a set of phenomena to be explained, whether they should all fall under one set of explanatory principles, or whether divisions should be made such that some of the phenomena should be treated in one way, and others in another. Hypotheses like (27) provide some guidelines about where possible lines of division might be sought. But without concrete proposals and testable predictions on what PF actually does, it is difficult to see how appeals to externalization alone are going to provide an explanation for the kinds of cross-linguistic variation that exist, rather than just a possible motivation for them. By this I mean that attributing cross-linguistic differences to the need to externalize is a kind of first step. To proceed further— and to provide something testable and perhaps eventually explanatory— involves making concrete proposals concerning what happens at PF (and what does not).

¹⁴For "language" here it is perhaps better to substitute "core grammar/CCS" or "faculty of language in the narrow sense."

To conclude, it will be interesting to see what comes out of concrete attempts to implement and assess (27) and the conception of PF that results from it.

5 Conclusions and further directions

This paper reviews several different ways in which morphology is implicated in theories of comparative syntax. To emphasize the point that this is an active domain of ongoing investigation, one of my primary goals has been to clarify key currents and identify pressing questions– and the manner(s) in which they may be investigated– rather than providing cut-and-dried answers. The discussion is focused on the questions Q1-3 from §1. I will review main conclusions on each of these in turn.

Q1: Reduction to morphology/the lexicon. In section §2 I reviewed the idea that syntactic variation can be reduced to morphology or the lexicon. While the proposals in question have relatively little to do with many parts of morphological theory, the idea that syntactic variation results from the properties of syntactic terminals is an important one, and connects with morphology in the sense that these terminals are morphemes. Whether or not this means of encoding differences has any visible consequences for morphology is, however, a different matter; it does not appear to have much to do with the theory of form. As far as I can tell, this kind of approach to variation is commonly assumed in the literature, although it might not always be flagged as such. For example, any claim to the effect that e.g. a Probe on Tense does XYZ in Language 1– but ABC in Language 2– amounts to encoding (morpho)syntactic variation in the properties of a syntactic terminal. While it is familiar in certain domains, ow successful this type of approach is for comparative syntax in general remains to be determined.

Q2: The universal and variable from syntax to PF. Part of what is at issue in §2 is the question of whether morphology is by definition simply arbitrary, i.e. where variation is encoded. Against this background, §3 looks at morphological theory as approached syntactically in Distributed Morphology, where there is an emphasis on an articulated theory of PF. The larger point developed in §3 is that contemporary theories are working towards a set of universal principles at play in morphology, some of which are syntactic, and some of which are part of the PF interface. This is a simple point, but it is sometimes overlooked. Part of morphology (and hence PF) is clearly subject to arbitrary cross-linguistic variation– i.e., the form/meaning connections that are established by Vocabulary Items, and the form/meaning connections with Roots. But this does not entail that everything about PF is arbitrary and subject to variation. Put differently, that there is a clear sense in which a “universal morphology” is a possible part of human language. An important question to ask then is whether PF universals are different in kind from those that are hypothesized to be part of the narrow syntax.

Q3: Externalization and syntactic variation. In §4 I reviewed a hypothesis in Minimalist syntax that attributes a much larger role to PF than the theory outlined in §3 does. The relevant proposals first assign certain types of displacement (and other operations, e.g. adjunction) to the PF component; and later move to the hypothesis that there is in fact no syntactic variation: instead, there is a single universal syntax-to-LF, with all apparent differences among languages being derivative of PF– the interface motivated by the need to externalize syntax. Several important questions of implementation arise concerning what it might mean for there to be a single syntax in this way. The main question at the heart of §4 is how it might be explored empirically. Programmatically, this would mean identifying two qualitatively distinct displacement systems, one part of the CCS and one part of PF.

* * *

It remains to be seen if further research will produce evidence in favor of the ‘restrained’ conception of PF outlined in §3, or a PF that is also responsible for most or all of what could be called ‘traditional’ syntax, as in §4. On this point, perhaps the largest conclusion to come out of this review is that there is a sense in which the question of how much syntactic variation is ‘morphological’ is still alive and kicking— understood now as a set of questions about the nature of PF— making a fleshed out theory of what happens at this interface an absolute necessity.

References

- Adger, D., Béjar, S., and Harbour, D. (2001). Allomorphy: Adjacency and agree. Paper presented at the 23rd *Glow Colloquium*, Braga, Portugal.
- Adger, D., Béjar, S., and Harbour, D. (2003). Directionality of allomorphy: A reply to Carstairs-McCarthy. *Transactions of the Philological Society*, 101(1):109–115.
- Alexiadou, A., Kramer, R., Marantz, A., and Oltra-Massuet, I., editors (to appear). *The Cambridge Handbook of Distributed Morphology*. Cambridge University Press, Cambridge.
- Andersen, T. (1992). Morphological stratification in Dinka. *Studies in African Linguistics*, 23(1):1–63.
- Andersen, T. (1993). Vowel quality alternation in Dinka verb inflection. *Phonology*, 10(1):1–42.
- Aoun, J. (1982). *The formal nature of anaphoric relations*. PhD thesis, Massachusetts Institute of Technology.
- Aronoff, M. (1994). *Morphology by Itself: Stems and Inflectional Classes*. MIT Press, Cambridge, MA.
- Arregi, K. and Pietraszko, A. (2021). The ups and downs of head displacement. *Linguistic Inquiry*, 52(2):241–290.
- Baerman, M. and Palancar, E. L. (2014). The organization of Chinantec tone paradigms. In *Carnets de Grammaire 22: Proceedings of Les Décembrettes, 8th international conference on morphology*, pages 46–59, Toulouse. CLLE-ERSS.
- Baker, M. (1985). The mirror principle and morphosyntactic explanation. *Linguistic Inquiry*, 16:373–416.
- Baker, M. (1988). *Incorporation: A Theory of Grammatical Function Changing*. University of Chicago Press, Chicago.
- Baker, M. (2008). The macroparameter in a microparameter world. In Bieberauer, T., editor, *The limits of syntactic variation*, pages 351–74. John Benjamins.
- Barbiers, S., Vanden Wyngaerd, G., and van der Wal, J. (to appear). Theoretical approaches to comparative syntax. for the *Cambridge Handbook of Comparative Syntax*.
- Bauer, W. (1993). *Maori*. Routledge, London and New York.
- Bennett, R., Elfner, E., and McCloskey, J. (2016). Lightest to the right: An apparently anomalous displacement in Irish. *Linguistic Inquiry*, 47(2):169–234.
- Berwick, R. and Chomsky, N. (2011). The biolinguistic program: The current state of its evolution and development. In di Sciullo, A. and Boeckx, C., editors, *The biolinguistic enterprise: New perspectives on the evolution and nature of human language*, pages 19–41. Oxford University Press, Oxford.
- Bjorkman, B. M. (to appear). Verbal inflection in Distributed Morphology. for A. Alexiadou, R. Kramer, A. Marantz and I. Oltra-Massuet eds. *The Cambridge Handbook of Distributed Morphology*.
- Bloomfield, L. (1933). *Language*. George Allen and Unwin Ltd, London.

- Bobaljik, J. D. (2002). Realizing Germanic inflection: Why morphology does not drive syntax. *The Journal of Comparative Germanic Linguistics*, 6(2):129–167.
- Bode, O. G. (2000). *Yoruba Clause Structure*. PhD thesis, University of Iowa.
- Borer, H. (1984). *Parametric Syntax: Case Studies in Semitic and Romance Languages*. Foris, Dordrecht.
- Borer, H. (2013). *Taking Form*, volume 3 of *Structuring Sense*. Oxford University Press, Oxford.
- Bye, P. and Svenonius, P. (2012). Non-concatenative morphology as epiphenomenon. In Trommer, J., editor, *The morphology and phonology of exponence*. Oxford University Press, Oxford.
- Caha, P. (to appear). Nanosyntax: Some key features. for A. Alexiadou, R. Kramer, A. Marantz and I. Oltra-Massuet eds. *The Cambridge Handbook of Distributed Morphology*.
- Carstairs-McCarthy, A. (1992). *Current Morphology*. Routledge, London.
- Chomsky, N. (1957). *Syntactic Structures*. Mouton, The Hague.
- Chomsky, N. (1965). *Aspects of the Theory of Syntax*. MIT Press.
- Chomsky, N. (1968). *Language and mind*. Harcourt Brace.
- Chomsky, N. (1970). Remarks on nominalization. In Jacobs, R. and Rosenbaum, P., editors, *Readings in English Transformational Grammar*, pages 184–221. Georgetown University Press, Washington D.C.
- Chomsky, N. (1981). *Lectures on Government and Binding*. Foris, Dordrecht.
- Chomsky, N. (1992). Some notes on economy of derivation and representation. *Anuario del Seminario de Filología Vasca "Julio de Urquijo"*, pages 53–82.
- Chomsky, N. (1993). A minimalist program for linguistic theory. In Hale, K. and Keyser, S., editors, *The View from Building 20: Essays in Linguistics in Honor of Sylvain Bromberger*, pages 1–52. MIT Press, Cambridge, MA.
- Chomsky, N. (1995). *The Minimalist Program*. MIT Press, Cambridge, MA.
- Chomsky, N. (2000). Minimalist inquiries: The framework. In Martin, R., Michaels, D., and Uriagereka, J., editors, *Step by Step: Essays on Minimalist Syntax in Honor of Howard Lasnik*, pages 89–156. MIT Press.
- Chomsky, N. (2001). Derivation by phase. In Kenstowicz, M., editor, *Ken Hale: A life in language*, pages 1–52. MIT Press, Cambridge, MA.
- Chomsky, N. (2011). Language and other cognitive systems. what is special about language? *Language learning and development*, 7(4):263–278.
- Chomsky, N. (2019). The UCLA lectures. <https://ling.auf.net/lingbuzz/005485>.
- Chomsky, N. and Halle, M. (1968). *The Sound Pattern of English*. Harper and Row, New York.
- Embick, D. (2000). Features, syntax and categories in the Latin perfect. *Linguistic Inquiry*, 31(2):185–230.
- Embick, D. (2007). Linearization and local dislocation: Derivational mechanics and interactions. *Linguistic Analysis*, 33(3-4):303–336.
- Embick, D. (2010a). *Localism versus Globalism in Morphology and Phonology*. MIT Press, Cambridge, MA.
- Embick, D. (2010b). Stem alternations and stem distributions. ms., University of Pennsylvania.

- Embick, D. (2015). *The Morpheme: A Theoretical Introduction*. Mouton de Gruyter, Boston and Berlin.
- Embick, D. (2016). On the targets of phonological realization. In Gribanova, V. and Shih, S., editors, *The Morphosyntax/Phonology Connection*, pages 255–283. Oxford University Press.
- Embick, D. (2021). The motivation for Roots in Distributed Morphology. *Annual Review of Linguistics*, 7(1):69–88.
- Embick, D. (to appear). Abstract morphemes and local contexts. for A. Alexiadou, R. Kramer, A. Marantz and I. Oltra-Massuet eds. *The Cambridge Handbook of Distributed Morphology*.
- Embick, D. and Marantz, A. (2008). Architecture and blocking. *Linguistic Inquiry*, 39(1):1–53.
- Embick, D. and Noyer, R. (2001). Movement operations after syntax. *Linguistic Inquiry*, 32(4):555–595.
- Embick, D. and Shwayder, K. (2018). Deriving morphophonological (mis)applications. In Petrosino, R., Cerrone, P., and Hulst, H. V. D., editors, *From sounds to structures: Beyond the veil of Maya*. Mouton de Gruyter.
- Fenger, P. (2020). *Words within Words: The Internal Syntax of Verbs*. PhD thesis, University of Connecticut.
- Fenger, P. and Kouneli, M. (this volume). Words and features. *The Cambridge Handbook of Comparative Syntax*.
- Grimshaw, J. (2005). *Words and Structure*. CSLI Publications, Stanford, CA.
- Halle, M. and Marantz, A. (1993). Distributed Morphology and the pieces of inflection. In Hale, K. and Keyser, S., editors, *The View from Building 20: Essays in Linguistics in Honor of Sylvain Bromberger*, pages 111–176. MIT Press, Cambridge, MA.
- Halle, M. and Vergnaud, J.-R. (1987). *An Essay on Stress*. MIT Press, Cambridge, MA.
- Harbour, D. (2008). *Morphosemantic number: From Kiowa noun classes to UG number features*. Springer, Dordrecht.
- Haugen, J. D. and Siddiqi, D. (2016). Toward a restricted realizational theory. In Siddiqi, D. and Harley, H., editors, *Morphological Metatheory*, pages 343–386. John Benjamins.
- Hoberman, R. D. and Aronoff, M. (2003). The verbal morphology of Maltese. In Shimron, J., editor, *Language processing and acquisition in languages of Semitic, root-based, morphology*, pages 61–78. John Benjamins, Amsterdam.
- Hockett, C. F. (1954). Two models of grammatical description. *Word*, 10:210–231.
- Hornstein, N. (2018). The minimalist program after 25 years. *Annual Review of Linguistics*, 4:49–65.
- Hornstein, N. (2019). The stupendous success of the minimalist program. *Current approaches to syntax: a comparative handbook*, *Comparative Handbooks of Linguistics series*, pages 187–214.
- Ingason, A. (to appear). Phases/cyclicality. for A. Alexiadou, R. Kramer, A. Marantz and I. Oltra-Massuet eds. *The Cambridge Handbook of Distributed Morphology*.
- Ingason, A. K. (2016). *Realizing morphemes in the Icelandic noun phrase*. PhD thesis, University of Pennsylvania.
- Kalin, L. and Weisser, P. (to appear). Minimalism and morphology. In Grohmann, K. and Leivada, E., editors, *The Cambridge Handbook of Minimalism*. Cambridge University Press, Cambridge.
- Kiparsky, P. (1982). Lexical morphology and phonology. In Linguistic Society of Korea, editor, *Linguistics in the Morning Calm: Selected Essays from SICOL-1981*, pages 3–91. Hanshin, Seoul.

- Koenenman, O. and Zeijlstra, H. (2014). The rich agreement hypothesis rehabilitated. *Linguistic Inquiry*, 45(4):571–615.
- Koopman, H. (1984). *The syntax of verbs*. Foris, Dordrecht.
- Kornfilt, J. (1997). *Turkish*. Routledge, London and New York.
- Leumann, M., Hofmann, J. B., and Szantyr, A. (1963). *Lateinische Grammatik, auf der Grundlage des Werkes von Friedrich Stolz und Joseph Hermann Schmalz; 1. Band lateinische Laut- und Formenlehre*. Beck'sche Verlagsbuchhandlung, München.
- Lieber, R. (1987). *An integrated theory of autosegmental processes*. State University of New York Press, Albany.
- Lieber, R. (1992). *Deconstructing Morphology*. University of Chicago Press, Chicago.
- Marantz, A. (1984). *On the Nature of Grammatical Relations*. MIT Press, Cambridge, MA.
- Marantz, A. (1988). Clitics, morphological merger, and the mapping to phonological structure. In Hammond, M. and Noonan, M., editors, *Theoretical Morphology*, pages 253–270. Academic Press, San Diego.
- Marantz, A. (1995). The minimalist program. In Webelhuth, G., editor, *Government and Binding Theory and the Minimalist Program*. Blackwell, Cambridge, MA.
- Marantz, A. (2001). Words and things. handout, MIT.
- Marantz, A. (2007). Phases and words. In et al, S. H. C., editor, *Phases in the theory of grammar*, pages 199–222. Dong In Publisher, Seoul.
- Marantz, A. (2013). Locality domains for contextual allomorphy across the interfaces. In Matushansky, O. and Marantz, A., editors, *Distributed Morphology Today: Morphemes for Morris Halle*, pages 95–116. MIT Press, Cambridge, MA.
- Newell, H. and Ulfsbjorninn, S. (2021). Phonological solutions to morphological problems. *The Linguistic Review*, 38(3):321–326.
- Noyer, R. (1992). *Features, Affixes, and Positions in Autonomous Morphological Structure*. PhD thesis, MIT.
- Pollock, J.-Y. (1989). Verb movement, universal grammar, and the structure of IP. *Linguistic Inquiry*, 20:365–424.
- Rohrbacher, B. (1999). *Morphology-driven syntax: A theory of V to I raising and pro-drop*. John Benjamins, Amsterdam.
- Saab, A. (2022). Bleeding restructuring by ellipsis new hopes for a motivated verbal ellipsis parameter. ms., Universidad de Buenos Aires.
- Travis, L. (1984). *Parameters and Effects of Word Order Variation*. PhD thesis, MIT.
- Wood, J. (2015). *Icelandic Morphosyntax and Argument Structure*. Springer.