Abstract morphemes and local contexts*

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1 Introduction

Locality is a topic of central importance in grammatical theory; accordingly, it is one of the major themes in the development of Distributed Morphology: both in comparisons with alternative frameworks, and in more theory-internal discussions.

Part of what is at issue in a review on morphological locality is the question of what falls under the purview of *morphology* in the first place. One of the defining intuitions of Distributed Morphology is that there may not be a single right-or-wrong answer to this question. In the words of Halle and Marantz (1993), the central intuition to be implemented and explored in the framework is that "...the machinery of what traditionally has been called morphology is not concentrated in a single component of the grammar, but rather is distributed among several different components." For this reason, the types of questions addressed within Distributed Morphology are broad in scope. They range from the more syntactic (affixation, periphrasis, morphosyntax of case and agreement, etc.) to matters of a more typically morphological nature (allomorphy, syncretism, exponence, blocking, the representation of gender and class information, etc.) to the interaction of morphology and phonology (morphophonology in the "narrow" sense). On the meaning-oriented side of things, there is work examining topics in argument and event structure and further topics in compositional semantics, as well as proposals concerning non-compositional meaning (allosemy, idiomaticity). This is a wide range of topics; and, as can be seen in the other papers in this volume, this summary is far from exhaustive. A review on locality must therefore be selective, and must also operate at a relatively high level of abstraction– especially given that the specific phenomena exemplifying different types of locality are reviewed in other papers in this volume.

With these considerations in mind, I have structured this paper as an explanation for why the theory of locality in Distributed Morphology is the way that it is. The starting point for this are the core properties of the theory. Those that are covered in many introductions to the topic are that it is (I) syntactic, and (II) piece-based, with (III) (at least some) *Late Insertion* of phonological material (see e.g. Embick 2015). Property (III), though accurate, is also too specific. The theory has adopted the position that in addition to being interpreted in context at PF, morphemes are also interpreted for meaning in context, such that the same Root or morpheme can be interpreted in ways that depend on the syntactically-derived structure in which it appears. This means that morphemes are *abstract* in a way that figures prominently in the pages to come.

In summary form, these three properties are as follows, where claim (III) has been modified in the way outlined immediately above:

(I) **Syntactic.** The syntax builds/operates on hierarchical structures which are ultimately realized as words, phrases, etc. Since syntactic structures are interpreted at the interfaces, locality conditions might be defined in terms of interface-specific relations that are derived from the syntax, in addition to being syntactic in the narrow sense.

(II) **Piece-based.** The interpretation of morphemes at the form (PF) and meaning (LF) interfaces is centered on discrete nodes: *morphemes*. This property distinguishes the theory from many other *realizational* approaches to morphology).[1]

(III) **Contextual interpretation.** Morphemes are *abstract*, and consist of purely syntactic features. They are subjected to interface-specific operations ("interpreted for form and meaning") in contexts that are created in the syntactic derivation.

The focus of this paper is primarily on the claim embodied in (III); more specifically, on the idea that morphemes are abstract, and that their interpretation is subject to locality conditions that are both syntactic and interface-specific. That is:

Abstract morphemes   While it might not insist upon a clear answer to the question of where morphology begins or ends, Distributed Morphology does take a clear stance on what a substantial part of *morphological theory* is about: namely, it concerns itself with *abstract morphemes* and the *contexts* in which they appear. The first part of this review is therefore directed at the question of what it means to be abstract in the relevant sense (and in a way that allows for comparison with pertinent alternatives).

Local contexts and the interaction of locality conditions   Abstract morphemes are purely syntactic. As such, they require interpretation at the interfaces, where they are associated with forms and meanings. A basic assumption on this interpretive process is that it is local in nature: not every morpheme in a structure can interact with every other morpheme. Locality conditions can in principle be of different types. Given the architecture of the theory, it is expected that locality conditions from both the syntax and the interfaces should be relevant to how morphology works,

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[1]I will put to the side cases in which *syntactic terminal* and *morpheme* might not be coextensive. These include (i) the possibility that certain morphemes are introduced only at PF, *dissociated* morphemes in the terminology of Embick (1997), see Adamson (2019) for a recent discussion; and (ii) the possibility that postsyntactic operations (Fission, Fusion, Deletion) may increase or decrease the number of morphemes undergoing Vocabulary Insertion relative to the number of syntactic terminals.

in addition to locality conditions that derive from the narrow syntax. A key theme in this part of the discussion is that the surface complexity of morphology (broadly construed) derives from the interaction of distinct types of locality conditions, not from a single type.

<center>THE PLAN</center>

Section 2 looks at the abstract morphemes employed in the theory and outlines the empirical motivations for positing morphemes of this type. Following this, section 3 looks at some proposals concerning locality that have been developed in the literature. The focus is on the interaction of syntactic and interface-specific locality conditions that is introduced above. Taken together, sections 2 and 3 constitute (in summary form) an argument that abstract morphemes and a locality-based theory of contextual effects are a necessary part of the theory of grammar. An implication of this view is that the grammar produces *misaligned* locality relations among morphemes: in particular, morphemes that are local at PF might not be so at LF (and vice versa); and morphemes that stand in a special syntactic relation (e.g. selection) need not be local at PF or LF. To drive this last point home, section 4 looks closely at the prospects for a theory with concrete morphemes. Morphemes of this type do not require contextual interpretation at the interfaces; moreover, in theories that employ them the locality domains for syntax, form, and meaning interactions are one and the same. The argument of this section is that when relatively simple cases of allomorphy are analyzed in a concrete morpheme theory, either serious problems result, or the moves that are necessary to implement a working analysis in effect produce an argument for abstract morphemes. Section 5 provides a general reflection on the current state of the theory, along with some reflections on where future work on my two central topics might lead.

2 Abstract morphemes and *Full Contextualism*

The topic of this section is what it means for morphemes to be fully abstract. Halle and Marantz (1993) follows Halle (1990) in positing a morpheme-based theory that adopts the *Separation Hypothesis*, typically associated with Beard (1966) (and many subsequent theories). Later versions of Distributed Morphology have worked with an extension to this hypothesis which has not typically been named or identified as such. For reasons that will become clear as the discussion unfolds, I will call result of the latter development *(Full) Contextualism*.

Approaching things quite generally, it can be observed that all theories must connect syntactic representations with *form* and *meaning*. Some such connections are general: for example, the semantic rule that applies to a transitive verb and its direct object; or the phonological alternation in which the English plural /z/ is realized as /s/ when it follows certain voiceless consonants. Other connections are unpredictable: for example, the fact that $\sqrt{\text{CAT}}$ has the phonology /kæt/, and (typically) has something to do with *felis catus* and related species; or that the T[+past] morpheme in English (sometimes) has the pronunciation /d/. The question at issue concerns what kinds of syntactic representations can be involved in *unpredictable* connections with form or meaning. One type of theory says that these are restricted to syntactic terminals; schematically, this is shown in (1):

(1)   Terminals only

<center>3</center>

[Syntactic terminals]

Form　Meaning
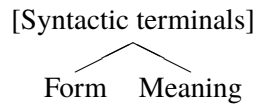
For reasons that I explain in the next section, this type of theory employs what can be called *concrete morphemes*.[2]

A second type of theory is more permissive than this. It says that in addition to syntactic terminals, it is also possible for syntactic structures (i.e., objects composed of more than one terminal) to be connected with unpredictable forms or meanings:

(2)　Terminals and structures

$$\begin{bmatrix} \text{Syntactic terminals} \\ \text{Syntactic structures} \end{bmatrix}$$
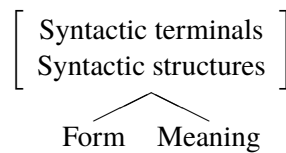
Form　Meaning

This is the approach that has been adopted in Distributed Morphology– it is a theory with *abstract* morphemes, whose forms and meanings can be determined in ways that make reference to their syntactic context. The rest of this section explains the concrete versus abstract distinction, and the motivation for moving towards the latter type of morpheme.

2.1　Concrete morphemes

The abstract morphemes reviewed in this section are best introduced by way of contrast. They constitute departures from a kind of 'classic' conception of the morpheme as a basic (=together 'from the beginning') combination of syntactic, semantic, and phonological information. That is:[3]

(3)　<form, syntax, meaning>

So, for example, a theory of this type would say that *cat* is a morpheme that combines a syntactic category like +N with a phonological representation /kæt/, and a meaning CAT: </kæt/, +N, CAT>. Or, it might analyze the 'agentive' *-er* suffix in English as in (4), where : [[ ]$_V$]$_N$ means 'is of category N and selects V':[4]

(4)　agentive suffix

　　　</r/, [[ ]$_V$]$_N$, 'one who habitually/professionally Vs'>

For my purposes here (and elaborating on (1)), what is important is that morphemes of this type link form and meaning to syntactic terminals without any reference to the syntactic context of that terminal. This makes the smallest syntactic unit the unique domain for both unpredictable form

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[2]The *concrete* versus *abstract* distinction is employed in Halle (1990).

[3]Strictly speaking, *syntax* in this triple should be broadened to something like *combinatoric*, since concrete morphemes can also be employed in theories that derive words in a non-syntactic lexicon. To keep things tractable, this review concentrates on morphemes in syntactic approaches.

[4]More detail on this point is provided in §4, where I look at concrete morphemes in Lieber's (1992) theory.

and unpredictable meaning. Because of this property, it is straightforward to represent the three types of information at play (syntax, form, meaning) as three facets of a single object: a morpheme that is *concrete* in the sense that it possesses both form and meaning. In grammatical derivations that involve morphemes of this type, form, syntax, and meaning are united in a terminal node, with the result that form and meaning are fixed when they enter a derivation.

Theoretically speaking, concrete morphemes enjoy a special kind of conceptual privilege. At a minimum, the grammar must relate a morpheme's syntactic properties to its form and its meaning; why not begin with the assumption that these three types of information are all represented in a single object from the beginning, since this is certainly the most restrictive approach?

The answer to this question is that there are empirical arguments on both the form and meaning side that the grammar does not employ concrete morphemes. I will review each in turn.

2.2   Contexts for form

The *Separation Hypothesis*, or *Separationism*, is the idea that form is not part of a morpheme's basic representation, but is instead separated from it. Schematically, this amounts to something like the following (cp. (3):[5]

(5)   The Separation Hypothesis

       syntax, meaning - - - - - - - - - - form

The move to Separationism is typically linked with Beard (1966), whose analysis of Serbo-Croatian adjectives argues that certain types of generalizations about form can be maximized by avoiding accidental homophony. In his implementation, the syntactico-semantic part of the morpheme is separated from its form: the derivation of adjectives is done transformationally, while phonological realization involves rules that apply in the morphophonemic component of the grammar.[6]

Generalized beyond Beard's specific assumptions, the basic idea is that there is *Late Insertion* of form. The relevance of this for the analysis of syncretism is that the mechanism for providing phonological forms can be underspecified with respect to the syntactico-semantic contexts that are operated on. This allows for syncretisms to be analyzed as systematic, something that most theories have identified as a priority (see Kramer this volume). This benefit comes with a cost, though; a grammar with Separation requires a mechanism that provides morphemes with their form, something that is not required if all morphemes are concrete.

The idea that syncretism requires a move to some sort of realizational process– i.e., to Late Insertion understood in some abstract sense– is perhaps the most widely-recognized argument against concrete morphemes. But there are other early arguments against them that move much

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[5]What Beard assumes about the semantics is not entirely clear to me; it is possible that (5) is oversimplified in terms of how syntax and meaning are related.

Concerning possible alternatives to (5), it is possible for a theory to employ morphemes that combine syntax and form at the level of the terminal, with meaning contextually determined post-syntactically. This would amount to adopting a kind of reverse Separationism (= "msinoitarapeS").

[6]Beard assumes the grammar of *Syntactic Structures* (see in particular Chomsky 1957:45-6), which has phrase structure rules followed by transformational rules, which are followed in turn by morphophonemic rules; I return to this theory immediately below, around (7).

closer to the questions about locality that are my concern here. One of these arguments also involves the morphophonemic rules that Beard appeals to as a way of implementing Late Insertion. It comes from Chomsky's (1957) analysis of the English verbal system. In this account, not all of the formatives that are manipulated by the syntax possess phonological representations. For example, the syntax generates objects like (7) with a transformation ("affix hopping") that attaches [past] to the verb:

(6) Mary+past+take+the+books.

(7) Mary+take+past+the+books.

The sequence *take+past* is then operated on by a morphophonemic rule that converts it to *took*. This rule takes precedence over others, e.g. the one that replaces [past] with /d/ in the case of *played*. This is Late Insertion: forms are determined in a way that makes reference to their context.

It is important to note that while Beard's move to Separation is motivated by the idea that syncretism should be analyzed systematically, Chomsky's is not; it is motivated by the interaction of Tense and the verb, which influence each other's allomorphy under conditions that interact with other aspects of English clausal syntax. In the context of the present discussion, the crucial point is that *past* and (perhaps to a lesser extent *take*) are abstract with respect to form: that is, form/syntax connections cannot be established in the syntactic primitives themselves, but must instead be established after the syntactic derivation.

To summarize, morphemes in a theory assuming (5) have no phonology. This move allows for syncretisms to be analyzed as systematic, since the rules or objects that supply morphemes with their form can be underspecified with respect to their syntactico-semantic distributions. And, since phonological forms are provided after morphemes are combined into complex objects, contextual allomorphy can be analyzed with the same sort of Late Insertion mechanism, specified so as to refer to elements in a morpheme's derived context.

2.3 Contexts for meaning

The same kinds of arguments for contextual interpretation of morphemes are found for meaning as well. On analogy with the form side, where such contextual effects are referred to as allo*morphy*, contextual interpretation of this type has been termed allo*semy*. Allosemy has been posited both for Roots and for functional heads; see Marantz (2013), Wood (2022), and Marantz and Myler (this volume).

One of the more salient arguments for this kind of contextual interpretation is found in Aronoff's (1976) criticism of a view of the morpheme associated with Hockett (1958). Hockett's morphemes have a constant form and a constant meaning, and an arbitrary link between the two. Aronoff presents an analysis of bound Roots in English like $\sqrt{\textsc{Ceive}}$ in *re-ceive*, *de-ceive*, etc. or $\sqrt{\textsc{Mit}}$ in *o-mit*, *e-mit* etc. as an argument against this kind of morpheme. The reasoning is straightforward: $\sqrt{\textsc{Ceive}}$ and $\sqrt{\textsc{Mit}}$ have no meaning, but the words they appear in do. It follows from this that there are at least some morphemes that do not have a fixed meaning, whose interpretation depends on the presence of other morphemes in their local context.[7]

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[7]A disclaimer: the idea that Aronoff's argument favors a theory with abstract morphemes is an interpretation and an extrapolation, not what Aronoff 1976 concludes or what Aronoff assumes in later work. His view is that lexical meaning is a property of the *lexeme*: by definition, a representation consisting of a combination of a Root and any number of derivational morphemes (cf. Aronoff 2007).

Roots $\sqrt{\text{MIT}}$ and $\sqrt{\text{CEIVE}}$ represent a kind of limit case on the meaning front, since they do not appear to have any 'basic' meaning associated with them; cp. $\sqrt{\text{CAT}}$ or $\sqrt{\text{STAB}}$. But allosemy is also found with the latter type of Root as well, where the *transparent* (or typical) meaning of a Root is absent in a particular context. So, for example, $\sqrt{\text{STAND}}$ appears transparently in constructions like *stand up*; but it does not have its transparent meaning with certain prefixes: consider. *understand*, or *withstand*).

This kind of contextual effect is not limited to the word. This point can be illustrated in the verbal system of German, which makes much more extensive use of prefixation to derive different meanings from the same Root. The prefixes in question are classified as *separable* or *inseparable*, depending on whether they move with the verb in V2 contexts or not. Crucially, Root allosemy occurs with both types of prefixes. This is illustrated in (8). First, in (8a), is the verb *verstehen* 'understand', where the Root $\sqrt{\text{STEH}}$ 'stand' does not have its typical meaning with inseparable *ver-*. The second example (8b) uses the Root $\sqrt{\text{FANG}}$ 'catch'; with the separable prefix *an* the meaning is 'begin':

(8) German prefixed verbs

    a. Die Maria **versteht**   fast   alles.
       the Mary understands almost everything

       'Mary understands almost everything.'

    b. Der Film **fängt**   morgen   um 3 Uhr   **an**.
       the film catches tomorrow at   3 o'clock AN

       'The film begins tomorrow at 3.'

The two pieces that interact for allosemy in (8b) ($\sqrt{\text{FANG}}$ and *an*) wind up distant from each other due to independent properties of German syntax. Nevertheless, they must be local to each other at some point in order to produce a special meaning.

There are several aspects of the 'abstract meaning' thesis that one could dwell on further, including how general it is supposed to be. One could ask, for example, if the move to abstract morphemes forces a particular view on whether or not Roots have meaning-related content 'inherently.' In particular, does the fact that Roots are interpreted in context require that all Roots be devoid of semantic content? As far as this line of reasoning goes, it is possible to find some parallel questions for functional morphemes, where contextual allosemy has been posited as well. The question is roughly the same; i.e., does the fact that there are different meanings associated with [+past] (e.g. politeness, as in *Did you want fries with that?*) require that this feature have no 'default' or basic interpretation associated with it? It could be e.g. that the meanings are related insofar as they involve the same semantic operation applying in different domains; see e.g. Iatridou (2000), Schlenker (1999, 2006), Harbour (2008) for proposals.

Questions of this type are the topic of ongoing investigation. The conclusion that is central to my purposes is that abstraction is needed on the meaning side. It is this move that (in conjunction with the conclusions of the last section) produces morphemes that are fully abstract.

2.4 Full Contextualism

Bringing the threads of the discussion together, a syntactic theory with contextual allomorphy and allosemy separates the three components of the concrete morpheme, in the way that is schematized in (9):

(9)   form, syntax, meaning

$$[\alpha_1...\alpha_n] \text{ (syntax)}$$

(PF: form; allomorphy)   (LF: meaning; allosemy)
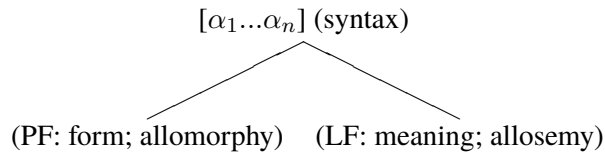
The morphemes in the grammar in (9) are composed of features that determine their syntactic behavior, and are assembled into complex objects in syntactic derivations. With respect to both form and meaning, these syntactic features are abstract: they are linked to forms and meanings at the interfaces, in ways that can be determined by the contexts they appear in. So, while a morpheme α_i is eventually associated with a form F_i and a meaning (or set of meanings) M_i, it does not have F's or M's represented with it from the beginning; rather, their interpretation at the interfaces takes place in a way that may make reference to morphemes in their syntactically-derived context. It bears repeating that morphemes in a grammar with full contextualism are purely syntactic objects. The interfaces must be able to 'see' their features, so that $[\alpha_i]$ is interpreted differently from $[\alpha_j]$, and so on; but the syntax is not sensitive to operations at the interfaces, nor is each interface sensitive to what happens at the other.

Two further points are in order concerning (9). The first, which applies primarily to the meaning side, is that there are several views concerning what kinds of meaning(s) are represented at LF (and what kinds of meaning are not). With this in mind, I will often speak of interfaces with 'meaning' in the discussion to come, when it is useful to avoid unwanted connotations associated with the use of the term *LF*. Second, PF and LF in (9) are not to be thought of as monolithic levels, as they were typically conceived of in e.g. the Government and Binding architecture (Chomsky 1981; Chomsky and Lasnik 1993). Instead– and this has been explored much more extensively on the PF side– the interfaces should be thought of as comprised of sequences of representations and operations on them that take the output of the syntax to an ultimate representation that makes contact with language-external cognitive systems.

Moving ahead, the idea is that abstract morphemes need to be interpreted for both form and meaning calls for a theory of the local contexts in which this occurs. This is the topic of the next section.

3   Contexts and interactions

In this section I will review some of the major themes that have emerged in the study of locality within Distributed Morphology. There are various topics that could in principle be reviewed here, but I will restrict attention to those that most clearly connect with Full Contextualism: allomorphy and allosemy.
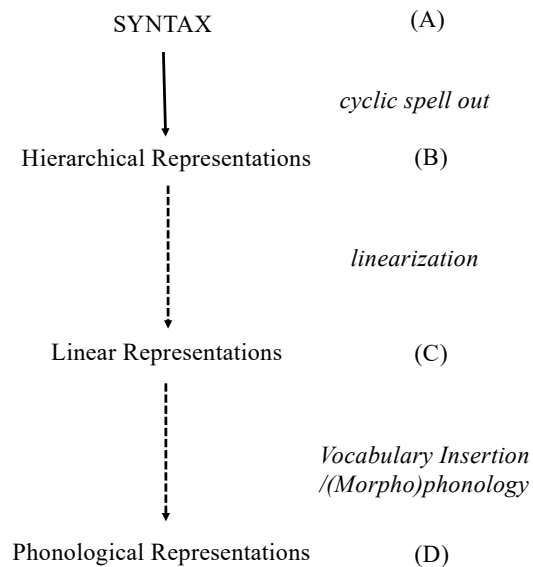
A starting point is the premise that there are indeed locality constraints that restrict possible interactions among morphemes. The contrary here is a theory that allows for global interactions, in which any morpheme in a structure could in principle affect any other. Though prima facie extreme there are subdomains in which of this kind of approach makes interesting predictions

that have been examined and compared with alternatives. For example, the more phonological part of Embick (2010) compares a localist version of Distributed Morphology with Optimality Theoretic approaches that allow potentially global interactions between allomorph choice and surface phonology. On the meaning side there are discussions of globalist alternatives as well; see Bach (1976) for a pertinent discussion.

The goal of this section is to provide a general overview. Although I will take some time to provide clarifications concerning certain types of predictions, my goal is not to provide a comprehensive review of the different proposals that have emerged in this area of work. Instead, the discussion is framed somewhat abstractly, and concentrates on the *types* of locality conditions that are active in the grammar.

The conditions to be examined are active at different stages: from the syntactic computation to its interfaces with form- and meaning-related systems (cf. 9)). On the form side, the view of PF that I will assume is schematized in (10):

(10)   PF branch with stages

<div align="center">

SYNTAX   (A)

cyclic spell out

Hierarchical Representations (B)

linearization

Linear Representations   (C)

Vocabulary Insertion
/(Morpho)phonology

Phonological Representations (D)

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In short form, the syntax is spelled out cyclically to both interfaces. At PF the hierarchical output is linearized, and the morphemes are given phonological form through the process of Vocabulary Insertion. (Morpho)phonology takes place at PF as well. Although there is less to be said about the specifics, I will assume that the output of the syntax is subjected to additional computations on the meaning side as well.

The locality conditions that comprise the theory of contexts are of three types; of these the third is specific to PF:

Cyclic   The hypothesis that syntactic structures are sent to the interfaces in cycles– i.e. a version of phase theory– provides one type of locality condition. In short form, the idea is that the cyclic domains created in this way defines which morphemes are active at the same time, and thus may interact in potentially 'close' ways; by way of contrast, morphemes that are not active in the same domain are not allowed to interact directly.

Relations between morphemes (linear or hierarchical)   When syntactic structures are interpreted, they are subjected to interface-specific computations that pertain to form and meaning. As noted immediately above, there is a fundamental sense in which the syntax restricts possible interactions between morphemes, deriving from syntactic cycles. However, it does not follow from this that all interactions between morphemes take place under locality conditions that are syntactic in the narrow sense. Rather, it appears that locality conditions at the interfaces– defined in terms of representations and relations that are determined by the syntactic structure– restrict possible interactions. Looking at PF in particular, a key question is whether these relations are hierarchical or linear, as will be explained below.

Morphophonological (in the narrow sense)   Phonology also takes place at PF, and involves representations and operations that have locality conditions of their own. In some versions of Distributed Morphology, this part of the grammar is responsible for *narrow sense morphophonology*: phonological alternations that are either triggered by particular morphemes, or restricted to apply to some morphemes and not others. The locality conditions involved in morphophonology specify possible interactions that (in most approaches) differ from those arising from cyclic spell out and morpheme-based locality conditions. For reasons of space I will not look at morphophonology here, beyond some comments in 3.4.

I will first review the theory of cyclic domains in 3.1, and then look at relations between morphemes in 3.2. In the latter section, the focus is on allomorphy, and on disentangling the different ways (hierarchical versus linear) that *adjacency* has been appealed to in the literature. Section 3.3 generalizes on these two sections. Recalling the general idea of section 2– in particular, the idea that morphemes must ultimately connect form, syntax, and meaning– a key theme to track is the extent to which morphemes might be local for one of these parts of the grammar, but not for the others. So, for example, two morphemes might interact for form (allomorphy) or for meaning (allosemy), even though they are not local in a narrow syntactic sense (=one does not Select the other). Or, two morphemes might be local at PF, but not at LF; or vice versa. This kind of *misalignment* of locality domains is possible with Full Contextualism, but not in theories with concrete morphemes. Section 3.4 summarizes the theory's main claims on this point as a prelude to the examination of concrete syntax in section 4.

3.1   Cyclic domains

There is a long history of theories that implement a distinction between two domains: one that allows special interactions to occur (unpredictable forms, or meanings), and one that does not. This line of inquiry starts (for practical purposes) with Chomsky (1970); for a review of cyclic domains and their connection to Roots see Embick 2022. The analysis of nominalizations developed in that paper proposes that there are two distinct domains for grammatical interactions, both for form and for meaning. Thinking of this in terms of how a Root relates to the features

responsible for nominalization, one of these domains allows 'close' interactions between the Root and the nominalizer, with possible idiosyncrasies (derived nominals like *destruction*); whereas the other domain prohibits idiosyncratic interactions between the Root and nominalizer (gerunds like *destroying*).

An important part of Chomsky's proposal is that the domains are equated with different grammatical operations. Derived nominals, which exhibit the close type of interactions, are formed when a category-less Root appears in a syntactic terminal position with nominal features. Gerunds, on the other hand, are formed by creating a verbal clause and applying a transformation to it. Although both of these mechanisms are syntactic, this is not how *Remarks* is interpreted by many later researchers. In various *Lexicalist* theories that make reference to it, the two domains are distinguished modularly: the *Lexicon* is for close and thus potentially idiosyncratic interactions (and for deriving and representing words more generally), while the syntax operates in a way that is transparent and free of idiosyncrasy. This distinction is one form of the *Lexicalist Hypothesis*.[8]

Due to associations between the Lexicon and the word, one way of thinking about this kind of theory is that the two domains (Lexicon versus syntax) are based on two distinct kinds of objects: words versus phrases. By extrapolation, the idea then is that 'the word' defines a privileged locality domain. Subsequent work in Distributed Morphology argues against this kind of Lexicalism– see Marantz (1997) in particular. At the same time, the intuition that there are two distinct domains for interaction plays a defining role in shaping the theory. The key question is how to reconstitute the two domains intuition in a theory that has no Lexicon; if it is not a modular distinction, how can it be implemented?

The answer that has been developed in the most detail makes direct connections with a hypothesis about how syntactic derivations operate. As outlined in Marantz (2001) and developed in much subsequent work (Marantz 2007, Embick and Marantz 2008, Embick 2010), the architecture of the Minimalist Program– in particular, the idea that syntactic structures are interpreted at the interfaces in a cyclic way– provides a hypothesis about how to define two distinct domains of interaction. As described above, morphemes are interpreted at each of the interfaces, represented in (9) by PF and LF (see below). The idea that syntactic derivations are interpreted incrementally– by *phase* in the sense of Chomsky (2000,2001)– provides a way of making the two-domains intuition concrete. Morphemes may interact in the 'close' way when they are active in the same phase together; if they are not local in this way, they are not capable of close interactions. This is a kind of cyclic locality, as stated in (11):

(11) CYCLIC LOCALITY: Morphemes can interact for allomorphy or allosemy only when they are active in the same cycle of spell-out.

At least three types of auxiliary hypotheses are required to implement this idea. First, it has to be specified which heads are cyclic (=trigger spell-out). A further set of assumptions specify precisely the domain that is spelled out when spell-out is triggered. Finally, a last set of assumptions specifies how material that has already been spelled out becomes inactive for later processes. Since each of these parts of the theory can be manipulated independently, there is potentially a wide range of hypotheses about cyclic locality that can be developed and explored.

To illustrate some of the essential concepts, I will outline one proposal in the literature, one that involves a version of phase theory that is essentially "phase impenetrability II" from Chomsky

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[8]See Carstairs-McCarthy (1992) for a discussion of developments within early Lexicalism.

(2000)– see Embick (2010) for allomorphy, and Marantz (2013) for allosemy. The emphasis is on the predictions that derive from the approach, not the details of how these are produced; see the works just cited for relevant details.

The approach in question defines category-defining heads like v, n, etc. as *cyclic*, in contrast to others like Tense or Number, which are *non-cyclic*. Cyclic heads trigger the spell out of cyclic domains in their complement. So, for instance, a Root like $\sqrt{\text{GLOBE}}$ can be merged with an adjectivizer a to produce *global*, as shown in (12):

(12)   *global*

$$
\begin{array}{c}
a \\
\diagup\diagdown \\
\sqrt{\text{GLOBE}} \quad a
\end{array}
$$
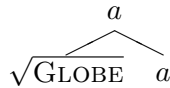
With merger of another cyclic head this structure is sent to the interfaces and interpreted for form and meaning. For example, adding an n, as in (13):
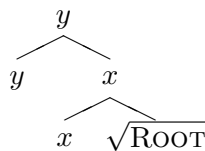
(13)   merger of n

$$
\begin{array}{c}
n \\
\diagup\diagdown \\
a \qquad n \\
\diagup\diagdown \\
\sqrt{\text{GLOBE}} \quad a
\end{array}
$$
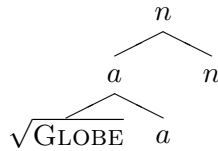
The cyclic n head triggers the spell-out of $[\sqrt{\text{GLOBE}}\ a]$. On the PF side, the a head is realized as *-al*; on the meaning side, the meanings of $\sqrt{\text{GLOBE}}$ that are active in the context of a are introduced.
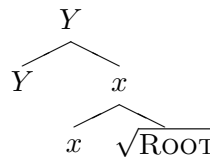
In a subsequent cycle, the cyclic domain centered on n is spelled out. In this cycle, the Root is *inactive*: this means that it cannot interact directly with n, for form or for meaning.[9] The a head is active, though; and it provides context for the insertion of *-ity*, which is the form taken by n outside of $[a,-al]$.

Generalizing, the important aspects of this theory can be summarized in comparing (14) and (15), where lower-case x, y are cyclic and upper-case Y is not:

(14) y not local to Root   (15) Y local to Root

$$
\begin{array}{c}
y \\
\diagup\diagdown \\
y \qquad x \\
\quad\ \diagup\diagdown \\
\quad\ x \quad \sqrt{\text{ROOT}}
\end{array}
\qquad\qquad
\begin{array}{c}
Y \\
\diagup\diagdown \\
Y \qquad x \\
\quad\ \diagup\diagdown \\
\quad\ x \quad \sqrt{\text{ROOT}}
\end{array}
$$

---

[9]So, for example, allosemes of $\sqrt{\text{GLOBE}}$ that are active only when it is merged directly with n (as in $[\sqrt{\text{GLOBE}}\ n]$, 'globe') cannot be activated by this outer n; see Marantz (2013) for discussion.

In (14), there can be no direct interactions between the Root and the outer categorizer y (or any heads outside of y).[10] On the other hand, an outer non-cyclic head Y is visible to the Root (and vice versa). This kind of situation is found in many instances of allomorphy, such as the English past tense (16) (*bend, ben-t*), or German plural (17) (*Gans/Gänse* 'goose, geese'):
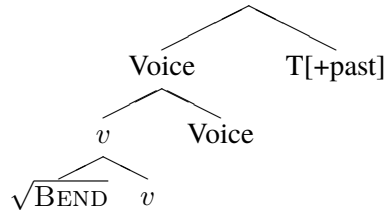
(16) *bent*　　　　　　　　　　　　　　(17) *Gänse*
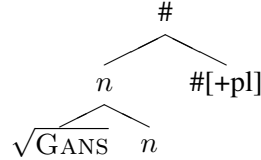
The fact that the Root and outer morphemes like T or # can see each other in structures like these is important for several reasons. For one, there are other morphemes between the ones interacting for allomorphy (v and Voice in (16); n in (17)). Thus, while these heads are active in the same cycle, they do not stand in a special combinatory relation (i.e. they do not Select each other). This observation will play an important role at several points in the discussion to come.

As I noted earlier, the outline I have presented is of one possible way of defining locality in cyclic domains. Other proposals continue to be explored along with these one; see Ingason (this volume) for a general discussion and case-study. What matters for my immediate purposes is not the different types of cyclic domain theories that can be compared and contrasted, but how cyclic domains interact with other types of locality which will be examined next.

3.2 Interface-specific effects: Relations between morphemes at PF

As a case-study for interface-specific locality I will look at allomorphy. The question in focus is how to compare hierarchical and linear conceptions of locality in this domain.

Starting abstractly, an important difference between hierarchical and linear relations is that the latter are associative, while the former are not. For $\alpha\beta\gamma$, an associative relation $\star$ is one that allows rebracketing; for example:

(18)　$(\alpha \star (\beta \star \gamma)) = ((\alpha \star \beta) \star \gamma)$

The standard view of syntactic constituency says that the hierarchical relations typically represented in tree diagrams are not associative; i.e.,

(19)　$[\alpha \, [\, \beta \, \gamma]] \neq [[\alpha \, \beta] \, \gamma]$

---

[10]While the main claims summarized here appear to be correct for a number of cases that have been studied in the literature, one important question for future work is whether there are some circumstances in which the Root and y might be local in something like (14). For example, Embick (2016) points out that both members of XN compounds in English (*blackboard*, *strawberry*, etc.)are able to see each other for allosemy, and suggests that when one element is directly head-adjoined to another([[$\sqrt{\text{STRAW}}$ n_1] [$\sqrt{\text{BERRY}}$ n_2]] , both Roots are active in the same cycle. Wood (2022) argues for something similar in event nominals, with direct merge of a verb [$\sqrt{\text{ROOT}}$ v] to a nominalizer creating [[$\sqrt{\text{ROOT}}$ v] n] where the Root and n are both active. It remains to be seen how to reconcile the apparent interactions seen in these cases with those in which domains appear to function as described in the main text.

On the left side of the equation, $[\beta\ \gamma]$ form a constituent that excludes α, whereas the right side represents the very different scenario in which $[\alpha\ \beta]$ form a constituent that excludes γ. Informally speaking, β and γ are closer on the left side than they are on the right side, where the bracket intervenes. A constituency-based view of locality might hold that α and β can interact in $[[\alpha\ \beta]\ \gamma]$, where they form a constituent, but not in $[\alpha\ [\ \beta\ \gamma]]$, due to β being bracketed with γ. If this interaction were constrained by linear adjacency, however, the predictions are different: α and β can see each other in this second scenario, assuming a linearization α-β-γ, because they are linearly local, and in spite of the fact that they are separated by a syntactic boundary. Put differently, associative linear relations allow for elements to be local in ways that "ignore" syntactic brackets.[11]

In the rest of this section, I will make some comparisons between two specific proposals based on hierarchical and linear adjacency. The goal is not to compare a wide range of such accounts, or to look at every instance that appears to be problematic for one or the other type broadly construed; see Gouskova and Bobaljik (this volume) for a general discussion. Instead, the focus is on how to distinguish and compare predictions. The particular comparison winds up favoring a linear condition, and I believe more generally that the evidence for this position is stronger than the evidence for hierarchical alternatives. But– to be perfectly clear in advance– the discussion to follow should be taken as *Here is what is at issue and how to distinguish pertinent predictions*, not *One view is correct and others are not.*[12]

The two proposals to be compared are as follows:

(20)   Hierarchical versus linear locality

    a. **(H)** Morphemes α and β may see each other only when no other morpheme intervenes between them: $[\alpha\ \beta]$

    b. **(L)** Morphemes may see each other only when they are immediately linearly adjacent: $\alpha^\frown\beta$

The former is adopted in Adger et al. (2001, 2003), Bobaljik (2012), and Borer (2013), among others; the latter is employed in Embick (2010) and related work, where immediate linear adjacency is represented with the concatenation operator $^\frown$.[13]

To start distinguishing the predictions of (H) and (L), I will look at the German Root $\sqrt{\textsc{Steh}}$, which is found in e.g. *stehen* 'to stand'. The past tense and past participle forms of this verb are both irregular– *stand-Ø* and *gestand-en* respectively– which indicates mutual visibility between the Root and Tense and Aspect morphemes. The affixation structure for the past tense (making standard assumptions) is given in (21):[14]

(21)   past tense of *stehen*

---

[11]This aspect of linear relations plays an important role in the analysis of bracketing paradoxes (see Pesetsky (1985)) in works like Sproat (1985) and Marantz (1988).

[12]A third view is that neither type of condition applies, so that locality is only domain-based; see Smith et al. (2019).

[13]Other types of linear relations appear to be at play in other parts of PF; see Pak (2008) and Adamson (2019) for discussion.

[14]Here and in many places below I will ignore the Agreement morpheme that occurs in past tense forms.

T
Voice   T[+past]
v   Voice
√STEH   v
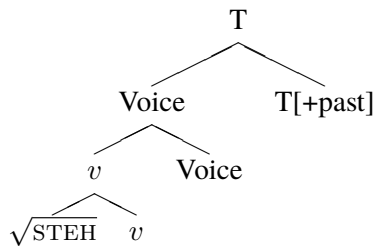
It should be clear that as defined in (20), neither (H) nor (L) allow the Root to see the past tense morpheme (and vice versa), due to the intervening v and Voice morphemes. Embick (2010) deals with situations of this type by eliminating ("Pruning"; cf. Embick 1995, 2003) certain morphemes that have no phonology, such that the Root and past tense morpheme are local prior to Vocabulary Insertion: $\sqrt{\text{STEH}}^\frown$T[+past].[15] To keep the discussion moving I will assume that the (H) theory can make the same kind of move, eliminating v and Voice to produce [$\sqrt{\text{STEH}}$ T[+past]]. With this kind of fix, then, both (L) and (H) are able to produce the correct results.

Things get more interesting when potentially intervening morphemes with overt phonology are brought into play. These cannot be deleted like their null counterparts. With $\sqrt{\text{STEH}}$, a case in point is provided by the prefix *ver-*, which (as we saw in section 2) combines with this Root to produce the meaning 'to understand'. The structure of the past tense of *verstehen* is shown in (22):[16]

(22)   past tense of *verstehen*

T
Voice   T[+past]
v   Voice
ver   v
√STEH   v
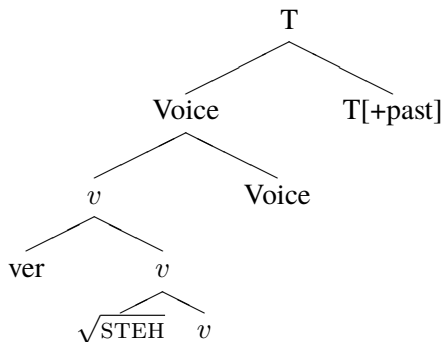
In this structure, (L) predicts the past tense realization *stand*, since $\sqrt{\text{STEH}}$ and the past tense morpheme continue to be immediately linearly adjacent. (H) does not make the same prediction, since the prefix disrupts the local relationship between the Root and Tense; taking into account Pruning of v and Voice, the representation is [[ver $\sqrt{\text{STEH}}$] T[+past]]. It is therefore predicted that there should be a regular past tense form (i.e. *ver-steh-t-e, where *-e* is an agreement morpheme), contrary to fact.[17]

---

[15]The exact point at which Pruning operations apply is a matter of ongoing discussion; see Paparounas (in press) for discussion.

[16]The prefix is shown attached to v; there are other possibilities. All of these would have it below Tense, which is what is needed to make my point.

[17]In another kind of hierarchical approach proposed in the literature, Vocabulary Insertion can target non-terminal nodes to produce allomorphy. For example, in (21), the top node would be realized by *stand*, a suppletive allomorph

The same type of problem arises in what is called *potentiation*: in short form, a scenario in which an inner affix determines the allomorphy of an affix outside of it. For example, the head found in modal adjectives in English (with the meaning 'capable of being VERBed') , which is realized as *-able*, always takes an *-ity* nominal: *break, break-able, break-abil-ity*, and so on. Structurally, though, the modal adjective head and the nominalizer are not expected to show allomorphy by (H), as can be seen in (23):

(23)   *breakability*

$$
\begin{array}{c}
n \\
\diagdown \\
a \qquad n \\
\diagdown \\
v \quad a[\text{mod}] \\
\diagdown \\
\sqrt{\text{Break}} \quad v
\end{array}
$$
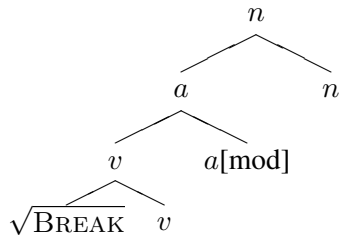
Both Adger et al. and Borer (2013) notice the issue with cases like (23), and propose ways of relaxing (H) to allow for potentiation to occur. For convenience, I will make reference to abstract (24) to illustrate these proposals:

(24)   Abstract structure

$$
\begin{array}{c}
\beta \\
\diagdown \\
\alpha \qquad \beta \\
\diagdown \\
\sqrt{\text{Root}} \quad \alpha
\end{array}
$$
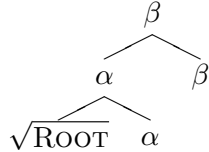
Adger et al. hold that β can be sensitive to α in this configuration because it is a sister to a projection that bears the label α. Borer makes α visible through percolation: features of both the Root and α are passed up to the dominating node, where they are visible to outer β for allomorphic purposes. Both of these proposals will allow e.g. β in to see inwards to α in spite of the intervening bracket.

When more cases are considered, though, label-visibility (LV) and percolation (Perc) run into a number of problems. For example:

Root visibility   (LV) relies on the label, which is determined by the head. Features of the non-head are thus not visible for outer morphemes. It is thus clear how it handles suffix potentiation of the *able-ity* type, but not clear how it could account for the tense-sensitive allomorphy of *verstehen* given typical assumptions about Roots and projection (perhaps something like Pruning and re-labelling is required).

(Perc) allows this kind of Root-visibility, since features of the Root are percolated and thus visible to an outer morpheme. While this is needed for *verstehen*, this kind of Root visibility is precisely what standard accounts of potentiation try to exclude. If Tense in German is sensitive

---

of $\sqrt{\text{Steh}}$. This theory also predicts that realization of *stand* should be impossible in (22) due to the presence of *ver-*. See Embick (2016b) for discussion and references.

to not the Root, but the [prefix Root] combination, then it is an accident that all [prefix Root] combinations show the same Root and Tense allomorphy. However, the identity of allomorphy with different prefixes is a completely general property of the language. (Perc) in principle allows each prefix-Root combination to select different outer allomorphs, but this never happens; it thus fails to account for a crucial generalization. The same goes for potentiation, where *patron-ize* takes *-ation* but e.g. *color-ize* could in principle form **color-ize-ment*.

What percolates?   Both (LV) and (Perc) are based on the idea that grammatical features can be visible on nodes higher than the morphemes on which they originate. Sometimes, however, potentiation appears to be triggered by a morpheme's exponent: that is, by a phonological representation. The adjective-forming a in English that appears as *-ous* in *vapor-ous* etc. and as and as *-al* in *trib-al* etc. illustrate this property. The latter potentiates *-ity* to yield *trib-al-ity* etc. (though see Embick 2012), while the former does not (**vapor-os-ity*). Why would the identity of an exponent or phonological features figure in a label or be percolated? More generally on the latter point, it could be asked how the feature manipulations employed by (LV) and (Perc) could be extended to phonologically conditioned suppletive allomorphy (Carstairs 1990, Paster 2006, Embick 2010).[18]

Directionality   Both (LV) and (Perc) are designed to make inner morphemes visible to outer morphemes. But allomorphic conditioning travels in both directions, such that inner morphemes must be able to see outer ones (Carstairs 1987 and much subsequent work). For instance, in the case of $\sqrt{\text{STEH}}$, Tense and Aspect have to see inwards to the Root; but $\sqrt{\text{STEH}}$ has to see outwards to these morphemes as well, since it is realized irregularly as *stand*. Generally speaking, cases of outwards-looking suppletive allomorphy are rarer than those that look inward, but they are attested. They can be accommodated easily under (L), but not under the versions of (H) under consideration.

As a way of focusing future investigation on this type of comparison, I will conclude this section with a schematization of a type of case-study that promises to be particularly informative. What I have in mind can be illustrated with reference to (24), and is based on a simple point. Concentrating on hypothetical interactions between the Root and β, the point is that in an (H) theory the linear position of α should be irrelevant; on an (L) theory, though, whether α intervenes between the Root and β depends crucially on how it is linearized. A minimal comparison would thus involve the same β outside of an α that is sometimes a prefix and sometimes a suffix.

To illustrate the reasoning, I will look at the Latin perfect system, where an aspectual head Asp[perf] and the Root often interact. To take one example, the verb *agere* 'do, drive, etc.' forms an irregular Perfect: *ēg-Ø-ī*. Here the Root is followed by a null allomorph of the Asp[perf] head; *ī* is first person singular agreement used in the citation form. This perfect form is athematic (i.e. no theme vowel intervenes between the Root and the perfect morpheme Asp[perf]), as is the case with all irregular Latin perfects. The verb shows both stem allomorphy and allomorphy for Asp[perf], which has the default form *-v*.

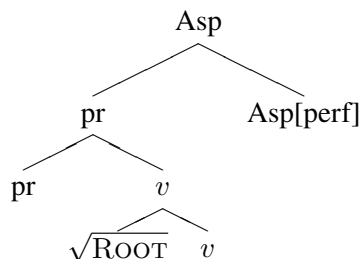Like many other Latin verbs *agō* forms a number of 'compounds', with a prefixed element

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[18]As for how phonologically conditioned allomorphy is accounted for: on the assumption that Vocabulary Insertion applies from the inside-out, the a head is realized before n. In a linear approach, it is then possible to say that the n head has its allomorphy determined by the exponent of the linearly-local a head.

(cp. German *verstehen* above). These show the irregular perfect form, as seen in (25):[19]

(25)   ad-igō, ad-ēg-ī 'bind etc.'
       per-agō, per-ēg-ī 'complete etc.'
       ⋮

Letting *pr* stand for the morpheme realized as the prefix, this morpheme attaches closer to the Root than the Aspect suffix, as shown in (26)

(26)   structure of prefixed verbs

$$
\begin{array}{c}
\text{Asp} \\
\diagup \quad \diagdown \\
\text{pr} \qquad \text{Asp[perf]} \\
\diagup \diagdown \\
\text{pr} \quad v \\
\diagup \diagdown \\
\sqrt{\text{ROOT}} \quad v
\end{array}
$$

As should be clear from the discussion above, in this structure Asp[perf] is structurally closer to the prefix than it is to the Root, and thus should not be able to see the latter according to (H); yet the irregular allomorphic relations continue to hold between the Root and Asp[perf]. This is the type of scenario in which (H) accounts need to make Root features visible to Asp[perf], as discussed with reference to (LV) and (Perc).

Latin provides the basis for an even more interesting contrast, since it also produces verbal derivatives through suffixation. Crucially, suffixal material between the Root and Asp[perf] does affect the allomorphy associated with Asp[perf]. For example, the "intensive" suffix *-it* can be added to *agere* to form *ag-it-ā-re* 'to do eagerly etc.', where *-ā* is a theme vowel. The perfect of this verb is *ag-it-ā-v-ī*, with (i) the default perfect affix *-v*, and (ii) no stem allomorphy on $\sqrt{\text{AG}}$.

On an (L) account the prefix/suffix asymmetry is straight-forward: suffixes intervene linearly between the Aspect morpheme and the Root; while prefixes do not. The absence of Root-determined allomorphy thus follows (as does the absence of allomorphy on the Root itself). An (H) account, on the other hand, owes an account of why it is that Root features are visible to Aspect in one of these scenarios and not the other. The question is how to relax the theory to allow allomorphy to occur when the prefix is present, but not when the potential interveners are suffixes.

The point of this illustration is not to suggest that such an account could not be given; there are various alternatives that could be explored (even if it remains to be seen what direction they move in).[20] Rather, this particular case study is useful because it allows for a relatively direct comparison: showing what happens to the same morpheme's allomorphy when a prefix or suffix intervenes between it and the morpheme that conditions its form. Of course, it could always be claimed that e.g. the prefix and the suffix are different in kind, and that this difference affects

---

[19]The initial /a/ of *agō* is reduced to /i/ in *ad-igō*.
[20]E.g. manipulating percolation mechanics, and the definition of *head*; cf. Lieber (1980,1992), Williams (1981), and Selkirk (1982). See also section 4.

allomorphic visibility. Which is to say, an even more minimal comparison would involve exactly the same intervening morpheme, which is sometimes linearized in one direction, and sometimes in the other. I have not yet found cases of this type but I hope that this discussion highlights their potential significance.[21]

Thinking about this in general terms, to the extent that visibility is consistently interrupted under linear (but not hierarchical) intervention, this would constitute clear evidence in favor of (L). Conversely, to the extent that hierarchical intervention regularly removes the visibility between morphemes, there would be evidence in favor of (H). For the reasons I have highlighted above, I believe the current state of the discussion is one in which the evidence typically favors (L). But as stressed at the beginning of the section my goal here has been to illustrate distinct positions and frame relevant comparisons in a way that will guide future investigation; not to argue in depth for one alternative or the other.

3.3   Interactions and domain (mis)alignment

The theory outlined above produces interactions: cyclic domains derived by incremental spell-out of syntactic structures determine which morphemes can potentially see each other, and interface-specific operations (e.g. those responsible for transparency) and relations (linear, or hierarchical) further restrict possible interactions. Morphemes may thus be local or non-local in both the phase-cyclic and interface-specific ways, as presented in (27):

(27)   Interactions schematized

	Phase Local	Not Phase Local
Interface Local	I1	I2
Not Interface Local	I3	I4

Sections 3.1 and 3.2 illustrate the (I1) and (I3) types of interaction with allomorphy: the cyclic domain produced by phase-based spell-out defines which morphemes could in principle interact; and a PF-specific condition then further restricts possible interactions to morphemes that are interface-local. Intervention– i.e., the (I3) scenario– is just as important for assessing locality conditions as visibility. For this reason, my sample comparison of linear and hierarchical approaches in 3.2 emphasizes the conditions under which morphemes apparently stop seeing each other for allomorphy.

The (I2) situation is one that relates directly to section 3.1. The theory of cyclic domains outlined there holds that in certain situations, morpheme like the Root and y in $[[\sqrt{\text{ROOT}}\ x]\ y]$ (x and y both cyclic) may be linearly adjacent (due to x being null), yet not able to interact for allomorphy or allosemy.

Finally, the (I4) type of interaction is of relatively little interest for morphology in the narrow sense, since morphemes that are in different cycles and not in a local interface relationship are not expected to interact. However, it is potentially relevant to phonology, and the question of how this part of the grammar interacts with phase theory; see Marvin (2002, 2013), Pak (2008), and Embick (2014) for perspectives.

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[21]The typical scenario in which the same morpheme can be realized as either a prefix or a suffix involves phonological sensitivity; see e.g. Noyer (1993) and Fulmer (1997) for case-studies.

A key aspect of this theory of locality is that it allows for locality domains to be misaligned in certain ways. That is, morphemes that are local at one interface might not be local at the other; and morphemes that are local to each other at the interface might not be related in terms of the how the syntax builds complex objects. I illustrate each of these possibilities in turn.

Misalignment 1: PF $\neq$ LF   A basic prediction of an abstract morpheme theory is that morphemes may be local at PF, but not at LF, and vice versa. A simple case of this is the Root-conditioned allomorphy of Tense and Number seen above. The latter morphemes are local to the Root for PF purposes. But there is no sense in which they are local to the Root or directly interact with it at LF.

Moving beyond this simple observation brings us to interface-specific locality that have been posited on the meaning side. The proposal in question concerns the locality conditions under which allosemy is found. Marantz (2013) analyzes (Root) allosemy as arising between morphemes that are (i) active in the same phase, and (ii) *semantically adjacent*. Putting to the side possible interpretations of the latter notion, the basic idea is that this aspect of meaning operates in essentially the same way as allomorphy does: phases determine which morphemes are active, and an interface-specific relation further restricts which morphemes may see each other in the relevant way.

The cases discussed by Marantz provide a useful illustration of how interface-specific locality conditions may produce situations in which morphemes that are local at one interface are not close enough to interact at the other. Abstracting slightly, the kinds of cases he examines involve participial formations, of a type represented schematically in (28):

(28)   Participle
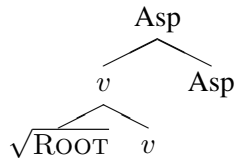
The interactions of interest involve Root meaning, and are triggered by Aspect. In order for these morphemes to be local, it must be the case that certain morphemes– in this example, the verbalizer v– are transparent at LF, on analogy with morpheme transparency effects at PF. Crucially, the v head can be transparent for meaning in this way even when it has an overt phonological realization. As a result, the morphemes that are local at PF are not the same as those that are local at LF. Using concatenation for PF, and with $\triangle$ standing in for semantic adjacency, the local relations are those in (29):

(29)   Local relations

   a. PF: $\sqrt{\textrm{ROOT}}^\frown v$, $v^\frown$Asp
   b. LF: $\sqrt{\textrm{ROOT}}\triangle$Asp

Stated more generally, what happens (and which morphemes are local) at one interface are irrelevant to what happens at the other; this is a central architectural prediction of the grammar in (9).[22]

---

[22]It is for this reason that (as noted in Halle 1973) cases in which meaning appears to be connected to something

Misalignment 2: Syntax ≠ PF, LF   One crucial aspect of the cyclic part of the theory is that while it specifies a domain in which active morphemes can potentially interact, interacting morphemes need not be in any particular syntactic relationship with each other: it suffices that they are simply active in the same cycle. I mentioned this point above, when illustrating sensitivity of Tense and Number in examples (16) and (17). The T[+past] and #[+pl] morphemes have their allomorphy conditioned by the Root, even though they do not Select it. The same kind of situation arises on the meaning side as well. In the examples of allosemy based on (28) from Marantz (2013), the Asp head that interacts with the Root does not Select it; it selects v (or Voice if that is present).

The general point that this observation raises is that the combinatorics of morphemes– in a syntactic theory, the ways in which they Select each other– are independent of the locality relations that define allomorphy and allosemy. The result is that syntactic locality in this sense and PF or LF locality are often misaligned. Sometimes this misalignment can be relatively extreme, with a morpheme's form determined by e.g. the phonological form of whatever happens to follow it. Pak (2016), for example, argues that the English indefinite article alternation *a/an* is a case of phonologically-conditioned suppletive allomorphy, with the two Vocabulary Items in (30):

(30)   D[-def] ↔ an/__V
       D[-def] ↔ a

The phonological conditioning can come from something syntactically close to the D head, like a noun (*an apple*); but the same effect is produced by any word that follows the article, like an adverb modifying an adjective, in *an amazingly resilient lanternfly*:

(31)   *an amazingly resilient lanternfly*
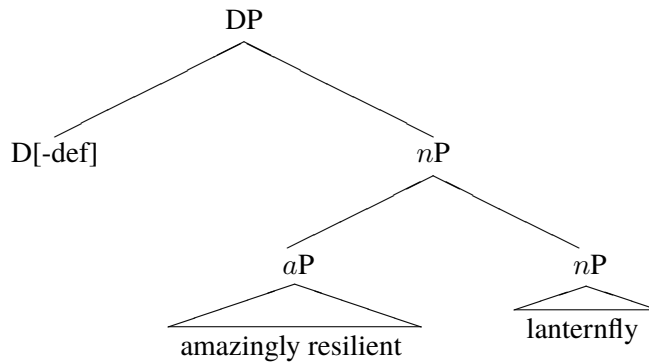
While D[-def] is connected closely to n in the sense that it Selects it, there is no syntactic relationship between the D[-def] head an an adverb that modifies the noun's adjectival modifier. Nevertheless, the form of D[-def] crucially depends on that element's properties.

The point that morphemes that do not stand in a privileged syntactic relationship can nevertheless interact for allomorphy (and allosemy) is an important one. It provides one way of comparing the predictions of an abstract morpheme theory and one with concrete morphemes, as will be seen in section 4.

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like allomorph choice call for special attention– for a recent discussion see Embick (2016), as well as Embick et al. (2023) for an overview.

3.4 Summary

This section has reviewed locality in Distributed Morphology with a focus on two ideas. The first is that locality conditions are of different types: deriving from cyclic spell-out (phases), and interface-specific as well. These conditions interact to produce attested patterns of interaction between morphemes. Bearing in mind the idea that morphemes bring together form, syntax, and meaning in the way described in section 2, a key point is that different types of misalignment are possible in the theory. Morphemes that are local in the cyclic sense need not be local at the interfaces; and morphemes that are local at PF might not be local at LF (and vice versa). For reasons of space, I have not reviewed proposals about narrow sense morphophonology in this section. When these are brought into the picture, the point about interactions and misalignment can be made with even more force. For example, it has been argued that morphemes can interact morphophonologically without being local for the purposes of Vocabulary Insertion (cf. Embick and Shwayder 2018 and references cited there). In addition, there are cases in which morphophonology can make other types of locality opaque, by e.g. separating two morphemes that interact allomorphically (Embick 2010, Kalin to appear).

The second main idea is that the theory is syntactic at its core. This point can be understood in at least two senses. The first is that cyclic spell out of the syntax defines the domains that constrain possible contextual interactions. The second is that interface-specific locality relations are derivative of the output of the syntax: even if they are linear, the linear relations are derived from the output of the syntax.

Although it is syntactic in these two ways, the theory does not claim that the combinatorics of morphemes is directly involved in the theory of contexts. Rather, the way in which morphemes select each other and combine is independent of their form and meaning: it is abstract and purely syntactic. This point is developed in detail in the next section, which contrasts the theory outlined here with a syntactic theory with concrete morphemes.

4   Comparisons with concrete syntax

The previous sections have examined abstract morphemes and the local contexts in which these are interpreted at the interfaces. As discussed in section 2, the opposite of abstract morphemes are *concrete* morphemes. In a theory that employs these, syntactic terminals are the only possible locus of unpredictable forms or meanings; such morphemes have their form fixed upon entering a structure. For this reason, this type of morpheme can be represented as combining syntax, form and meaning as three components of a single object; there is no "Late Insertion" at either interface.

As discussed in section 3, abstract morphemes allow the combinatorics (i.e. the syntax) to operate in a way that is independent of what happens at the form or meaning interfaces. Local relations between morphemes may thus be different in each of the syntax, PF, and LF. Concrete morphemes make these sorts of misalignments impossible. Stated in the positive direction, it is predicted that the domains for contextual interactions are aligned in a way that is directly linked to how they combine; that is:[23]

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[23]If space/time permitted it would be instructive to look at (32) in connection with Montague Grammar as developed in Dowty (1978, 1979) (and on the morphophonological side by Schmerling 1983), since (32) follows from the architecture of this approach (although with some interesting complications that arise from the ways in which Dowty employs distinct *syntactic* and *lexical* rules.

(32)　*Domain alignment prediction:* Relationship under which morphemes combine = domain for allomorphy = domain for allosemy.

Put sightly differently, the same local relations that determine how morphemes combine in the syntax (or in the Lexicon) delimit possible unpredictable interactions for form and meaning as well.
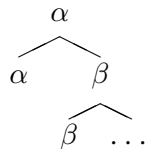
The prima facie appeal of a theory with concrete morphemes is that it does not require interpretive operations at the form and meaning interfaces, and an attendant theory of locality for each of those. As discussed in section 2, this gives concrete morphemes a kind of priority, with the move to abstract morphemes requiring empirical motivation. The theory of locality outlined in section 3 serves as a sort of proof-of-concept for this move; that is, an argument that what has been discovered about contextual effects in language requires a grammar with abstract morphemes and a theory of locality of a particular type. This section completes a complementary line of argument by looking at the theory of contexts in a syntactic approach with concrete morphemes, and showing what it can and cannot do.

As noted above, concrete morphemes can be employed in both syntactic and lexical theories. In each of these, there are principles that determine how morphemes combine with one another. In a theory employing morphemes that combine in the Lexicon, this information is typically stated in terms of subcategorization frames, as shown in (33a); this is a morpheme of type α that attaches to objects of type β. In a syntactic approach, this work is done by Selection, as in (33b), where the head α selects β:

(33)　a.　α subcategorized for β

　　　　$[[_\beta \quad] \; \alpha]$

　　b.　α selects β

$$
\begin{array}{c}
\alpha \\
\diagup\diagdown \\
\alpha \quad\quad \beta \\
\diagup\diagdown \\
\beta \quad \ldots
\end{array}
$$

For convenience, I will refer to the types of relations schematized in (33) as *Principled Combinatory Relations* (PCRs). The general theory of domains that is produced in a PCR-based theory is then (34):

(34)　*Theory of context with concrete morphemes:* Morpheme α can have its form/meaning determined by morpheme β (and vice versa– see below) only if α PCRs β.

Effectively, then, this approach defines two domains for possible interactions: (i) morphemes in a PCR relationship, where unpredictable interactions are possible; and (ii) every other relation between morphemes, where such interactions are impossible.

4.1　Concrete syntax: A first illustration

My focus in 4.2 is on a certain type of concrete syntax theory that is inspired by some discussions in the recent literature. Before looking at these, though, it is useful to review some key elements of

Lieber's (1992) concrete syntax approach. This work, which extends Lieber (1980), is one of the most worked-out concrete morpheme theories to have been developed, and even a brief review of its properties reveals many points that are directly relevant to more recent proposals concerning concrete morphemes.[24]

Lieber's approach is syntactic; she extends X-bar theory so that it can produce recursion on X^0, which allows for the creation of internally complex heads. Concrete lexical items like that for verb-forming *-ize* in (35) appear as the terminals of the binary-branching trees that are created in this way:[25]

(35) -ize [$_V$ [$_{N,A}$]   ]
      [ayz]
      LCS: [CAUSE ([$_{Thing}$], [BE (LCS of base)])]
      PAS: x

The features of lexical items are percolated upwards in a way that determines the properties of the derived word. So, for instance, the word *colorize* (=[$_V$[$_N$color] ize]) is a verb, which means that the [+V] feature of *-ize* needs to percolate, not the [+N] feature of *color*.

The features that are present and percolate are subject to cross-linguistic variation. Lieber assumes that the words of each category in a given language possess what is called a *categorial signature*. Informally speaking, this is an abstract specification of all of the features that they bear. For example, finite indicative verbs in German are of category V, and marked for Tense (past and present) as well as Agreement (first, second, and third person, singular and plural); the categorial signature of the German verb is thus as in (36):

(36) categorial signature for a German verb

$$
\begin{bmatrix}
V \\
\pm\text{past} \\
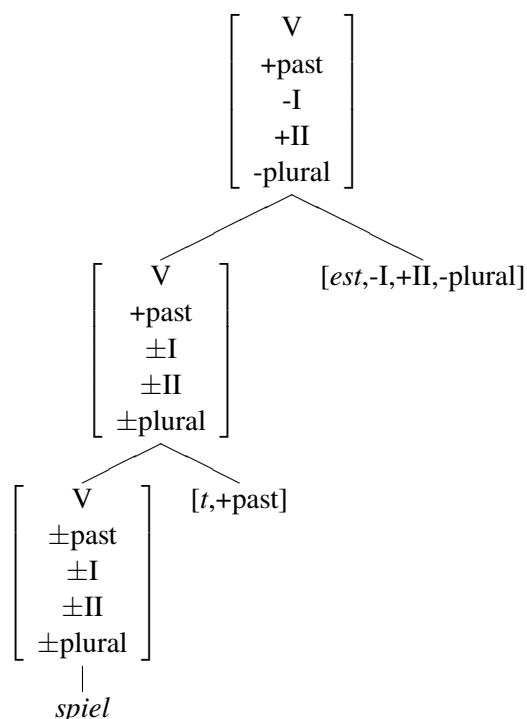\pm\text{I} \\
\pm\text{II} \\
\pm\text{plural}
\end{bmatrix}
$$

The features percolated from affixed morphemes fill (or value) the categorial signature. For example, in *spiel-t-est*, the second singular past tense of the verb *spielen* 'to play', affixation of past tense *-t* and second singular *-est* as in (37a) produces the complete categorial signature shown at the top of the tree:[26]

(37) spiel-t-est 'you played'

---

[24]A related project would be to examine the predictions of a Lexicalist theory on this front– Kiparsky (2021), for example. I will leave this for another occasion.

[25]LCS = 'Lexical Conceptual Structure', i.e. meaning; PAS = 'Predicate Argument Structure.'

[26]The segmentation here could actually be *-te* for past tense and *-st* for second singular; this does not affect the main point of the example.

$$
\begin{bmatrix} \text{V} \\ +\text{past} \\ -\text{I} \\ +\text{II} \\ -\text{plural} \end{bmatrix}
$$

$$
\begin{bmatrix} \text{V} \\ +\text{past} \\ \pm\text{I} \\ \pm\text{II} \\ \pm\text{plural} \end{bmatrix}
\qquad [\textit{est},\text{-I},\text{+II},\text{-plural}]
$$

$$
\begin{bmatrix} \text{V} \\ \pm\text{past} \\ \pm\text{I} \\ \pm\text{II} \\ \pm\text{plural} \end{bmatrix}
\qquad [\textit{t},\text{+past}]
$$

spiel

The example in (37) shows how affixation produces a regular past tense verb. For irregular allomorphy, Lieber identifies questions for this approach that are introduced in a slightly different form in section 3.2 above. As was discussed there, many German verbs do not show the *-t* affix in the past tense. Two of these are based on the Root $\sqrt{\text{STEH}}$ 'stand': *stehen* 'to stand' and *verstehen* 'to understand' (recall (21) and (22)). In both of these verbs, the Root appears as *stand* in the past tense. Thus (using second singular for consistency with (37)) we have e.g. *stand-st* 'you stood' and *ver-stand-st* 'you understood.'

I have not segmented a past tense morpheme in these forms because the status of [+past] is precisely what is at issue. As we saw in 3.2, the past tense morpheme is arguably immediately local to the verb in the case of verbs like *spielen* (as shown in (37)) or *stehen*. The latter case is instructive for understanding concrete morphemes. Because the past tense morpheme is subcategorized for the verb, and thus local to it in the sense required by (34), this allomorphic interaction can be accounted for directly in Lieber's approach. But what about with *ver-stehen*, with the prefix? Here the past tense affix attaches after the prefix is added; that is, it attaches to [*ver steh*], not to [*steh*]. How is it, then, that the verb and this morpheme can see each other?

Lieber considers an argument from Toman (1987) to the effect that a diacritic feature of the verb, given as [+strong], percolates to the node that dominates the verb and the prefix. If this happened, the past tense morpheme would be attaching to a verb with [+strong], and could be affected accordingly. Lieber, though, argues forcefully that diacritics cannot percolate in this way. Moreover, percolation does not explain how the verb is able to see the past tense morpheme, so that it is realized as *stand* instead of *steh*.[27]

The theory thus requires another way of accounting for the *steh*/*stand* alternation. The solution that Lieber arrives at posits a lexically listed stem allomorph *stand* that bears the feature [+past]
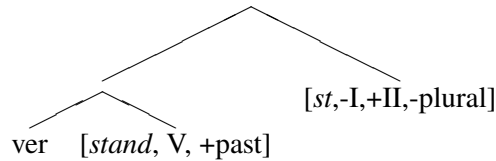
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[27]On these points, see also the other comments regarding percolation at the end of section 3.2.

as part of its lexical representation. The structures for *standst* and *verstandst* are then as follows; here and below I am omitting the percolated features for graphical convenience:

(38) a. *standst*

[*stand*, V, +past]   [*st*,-I,+II,-plural]

   b. *verstandst*

[*st*,-I,+II,-plural]
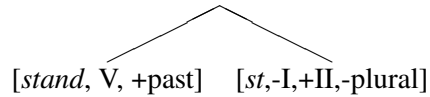
ver   [*stand*, V, +past]

The conspicuous thing about (38a,b) in comparison with (37) is that the former involve fewer morphemes; effectively, the stored stem *stand* does the work of what for regular verbs would be two lexical items, the Verb and the tense morpheme.[28]

Lieber's approach takes stem storage (i.e., suppletion) to an extreme; it is presumably at play in most cases of allomorphy, although one could get subtle about this. But that is not the aspect of her approach that I will focus on here. The question to be addressed instead is how this kind of analysis handles *blocking*. In the examples in (37-38), this is (informally speaking) how it is that the irregular past stem *stand* prevents the regular past affix *-t* from attaching to it to yield ungrammatical **stand-t-est* and **ver-stand-t-est*.

An approach with Vocabulary Insertion accounts for blocking this by assuming that any particular morpheme may undergo this process only once. So, for example, the grammar of German contains the Vocabulary Items in (39), which compete for insertion to the morpheme T[+past]:[29]

(39) Two VIs in German

T[+past] ↔ -Ø/{√STAND, √FANG, ... } ___
T[+past] ↔ -t

If e.g. √STAND is present, the VI inserting -Ø wins the competition; after this, there is no morpheme for the VI that inserts *-t* to apply to. Thus, the VI with -Ø blocks the VI with *-t* (see Embick et al. (2022) and Kastner (this volume) for additional discussion of blocking).

In Lieber's approach it is not possible to appeal to this type of solution, since it puts the explanatory burden on abstract morphemes and Vocabulary Insertion, which have no role in a concrete morpheme theory. Instead she appeals to the principle in (40):

---

[28]The idea that lexical items may be specified to occupy multiple positions is developed further in the stratal approach developed in Inkelas (1993); see also Caha (this volume) something similar (albeit with different architectural assumptions).

[29]It would be possible to use a diacritic like [+strong] here rather than a list. I am also putting to the side some details that could be considered in a comprehensive analysis, such as the apparent identity in form between regular past tense and past participle exponents (both *-t*).

(40)   An inflectional morpheme adding a feature X cannot be added to a word whose categorial signature already contains a value for X.

In the example under consideration, the idea is that since the past tense stem *stand* already bears [+past], the lexical item with *-t* that adds past tense morphology to regular verbs cannot apply to it.

The principle in (40) (or something like it) plays a role in many theories of morphology. It appears as Marantz's (1984) "No Vacuous Affixation Principle" (see also Kiparsky 1983). It also appears in Anderson (1992), and is criticized in detail in the context of that approach in Halle and Marantz (1993). It also plays a role in the syntactic approach of Collins and Kayne (2020), as will be seen below.

There are many things that could be said about the particular form it takes in (40).[30] For my purposes here, the importance of this brief look at Lieber's theory is that it highlights questions that any concrete morpheme theory must answer. In review, the key point to start with is that the form of concrete morphemes is fixed when they first combine to enter a complex structure. Thus, only possible context for unpredictable allomorphy is a morpheme's subcategorization frame. This restriction runs into difficulties that Lieber treats by generalizing the use of stored stem alternants. This analysis in turn faces questions about blocking that (40) is intended to address.

As we will now see, the same kinds of questions about irregular allomorphy and blocking also arise in much the same way in more recent analyses employing concrete morphemes– along with some additional points of interest.

4.2   Concrete syntax redux

In this section I will look at two different ways of analyzing contextual effects in a concrete morpheme theory, with a focus on allomorphy. These analyses employ different starting assumptions from Lieber's, and are based on proposals in the literature (see below). The approaches to be considered are as follows:

- ***Allomorphs as distinct subcategories*** One possibility is to treat allomorphs as differently distributed variants of what is otherwise the same head. So, for example, the /d/ and /t/ and -Ø allomorphs of English T[+past] would be three heads $[T[+past,/d/]_1$, $[T[+past,/t/]_2$, $[T[+past,/Ø/]_3$ that combine with different verbs. Generalizing, this approach treats the different allomorphs of a head as distinct *subcategories* of that head.

- ***Allomorphs as distinct heads*** A second possibility is that notions like 'past tense' are syntactically complex, and may potentially involve multiple syntactic heads: [T_1 [T_2 [T_3 ... rather than a single head like T[+past]. Each of these heads can then be assigned a distinct concrete form (/d/, /t/, /Ø/).

The second of these is (or is a version of) an approach developed in Collins and Kayne (2020); the first is my own creation.

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[30]For one, it contains an important qualification: Lieber stipulates that this principle applies only to inflectional morphemes. Derivational morphemes are not subject to it, and may thus contribute features to the categorial signature that override previous specifications. It is worth thinking about the nature of this restriction– i.e. whether it is descriptively accurate, and if so, what it might follow from– but this is not the place for that.
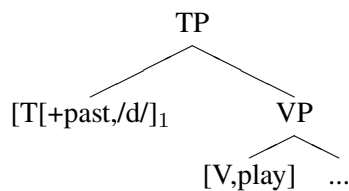
To preview, it is possible to account for some basic facts about allomorphy in each of these approaches, but a number of problems arise when we move beyond a relatively simple level. In particular, the proposals in question run into three specific types of difficulty.

The first two are those identified in the discussion of Lieber's approach immediately above: (i) contextual interactions do not appear to be restricted to morphemes that are in a selectional relationship in the first place (cf. the discussion of prefixed verbs); and (ii) accounting for blocking effects. The two approaches to be considered have slightly different things to say about the latter, as we will see below.
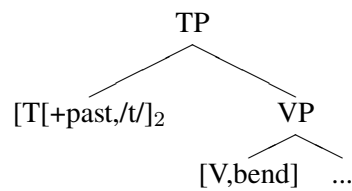
The third type of difficulty, novel to this section, concerns *interactions with other syntactic operations*. A concrete morpheme theory restricts the domain for contextual interaction to the selectional requirements of that morpheme. For this reason, a morpheme's form is fixed upon merger. It is thus predicted that later syntactic operations affecting these objects should have no effect on form: that is, that when X attaches to Y, the morphological form of both has been determined, period; further syntactic action should have no effects on morphology. This prediction is the opposite of what is expected in a theory with abstract morphemes: since form is determined after the syntax, in an abstract approach, syntactic operations can in principle directly affect morphological form, by e.g. moving morphemes so that they are not local to each other when form is determined. Relatively simple case studies suggest that the latter view is correct.

The subcategory approach   Moving on now to a syntactic approach, and putting to the side the important question of how exactly Selection works (though see the comments on symmetry below (41-42)), it is possible to develop a working account of contexts-for-form without too many difficulties. I will illustrate with English Tense allomorphy, with the allomorphs seen in *play-ed*, *ben-t*, and *hit-Ø*. One class of verbs in English, the 'regulars', would appear in syntactic structures with a Tense head T[+past,/d/]$_1$. The other allomorphs, i.e. the /t/ in *ben-t*, *lef-t*, etc., or the Ø with *hit-Ø* etc., are produced with two additional Tense heads T[+past,/t/]$_2$ and T[+past,/Ø/]$_3$. Which of these appears in a given clause depends on the verb that is selected; the structures for *play-ed* and *ben-t* are as follows:[31]

(41) *played*

(42) *bent*

$$\text{TP}$$
$$[\text{T[+past,/d/]}_1] \quad \text{VP}$$
$$[\text{V,play}] \quad \ldots$$

$$\text{TP}$$
$$[\text{T[+past,/t/]}_2] \quad \text{VP}$$
$$[\text{V,bend}] \quad \ldots$$

The important point about this theory is that the form of the Tense morpheme directly defines its distribution. This makes the different allomorphs different *subcategories* of Tense; in the same way that (for example) theories of phrase structure with a category V may define subcategories like V$_{\text{intransitive}}$ (appears without an object) and V$_{\text{transitive}}$ (occurs with an object). Though part of Tense's distribution is defined abstractly– it appears in the same position in the clause irrespective of allomorph– the finer details of its distribution (i.e. which verbs are local to it) are determined

---

[31]T is shown Selecting V (not v, or Voice) for reasons that will emerge as the discussion proceeds.

by its phonological form.

On the question of how Selection operates, basic facts about allomorphy require that it be a symmetrical relation. In the same way that Tense can see the verb for allomorphy, the verb is sensitive to Tense, as seen in *sang-Ø*, *wen-t*, *tol-d* and so on. [32] This effect thus requires a view of Selection in which both the selecting and the selected heads are capable of interacting in a close way.

The blocking of the *-ed* affix by *-t* can be accounted for in (42) in a straightforward way. Selection of *bend* allows $T[+past,/t/]_2$ to effectively 'win' over $T[+past,/d/]_1$. This is not, however, competition for insertion. Rather, the intuition is that this effect arises in the same way that it does when e.g. D might select for N, but Aspect does not; or C might select for Tense, but e.g. Prepositions do not. The difference between these scenarios is that while e.g. D and Aspect differ both syntactically and semantically, $T[+past,/d/]_1$ and $T[+past,/t/]_2$ differ only in their phonological form. They must be represented as distinct syntactic objects in the theory under consideration, though, for the reasons outlined above. I will return to this point in 4.3.

In addition to basic blocking, some further types of interactions appear to be straightforward on this working analysis. Consider e.g. negation and its interaction with Tense allomorphy. In English, the presence of negation prevents Tense and the verb from appearing in an affixation structure. The allomorphy part of this is straightforward on a syntactic approach: if T selects Neg (and not *bend*), then it will no longer have the *-t* form, since that occurs only with certain verbs. Rather, the past tense forms of *do* are found; this can be analyzed as another Tense head (T[DID]) that selects negation.

Further examples involving interactions of Tense and the verb lead to difficulties. Consider T-to-C movement, in examples like *Did Mary bend the metal rod?* Here there is no head intervening between T and the verb. All else equal, this should call for the *-t* version of Tense to be employed, since the PCR between these heads is identical: T selects V in questions in the same way that it does in declaratives, and in a concrete morpheme theory, there is no way of changing a morpheme's form once it has been merged.

Taken at face-value, as it is in many theories of affixation, the interaction of *do*-support and verbal allomorphy demonstrates that movement can potentially bleed Root-conditioned Tense allomorphy by bleeding the affixation operation that feeds it– i.e., it moves Tense out of a local configuration in which it can see the Root (and vice versa); recall the discussion of Chomsky (1957) in section 2. Stated succinctly, this makes it look very much like the locality conditions for allomorphy are not Selection-based, since two different things can happen to T's pronunciation when it selects the same verb. If morphology is determined after this happens, i.e., if morphemes are abstract– this is not a problem. But it is a problem for theories whose morphemes' form is determined from the moment they enter a structure.

It is possible to explore options that do not make these incorrect predictions. If there were an extra head between T and V in questions that does not appear in declaratives, then it might be possible to have this head selected by T[DID]. For instance, it could be held that C[+wh] selects T[DID], where DID stands in for forms of *do*, with T[DID] selecting the additional head X; the local relation with the verb would then not obtain, just as in the case of negation. In the absence of independent evidence, though, these moves look quite ad hoc; especially so when we

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[32] A consequence of this view is that all Root allomorphy must involve distinct morphemes (i.e., it is invariably suppletive).

consider that the augmented approach still makes incorrect predictions: some questions with *wh*-movement have *do*, (*What did Mary bend?*) but others do not (*Who bent Wilmy's favorite flute?* or *How come Sammy bent the silver ingot?*). Whatever the correct analysis of these effects is, it does not appear that a concrete morpheme theory is in a position to say much about them.[33]

To summarize, the subcategory view has some success with blocking, but runs into difficulties when interactions with movement and affixation processes are taken into account. It is possible that investigating possible fixes to those pointed to above would prove insightful; this remains to be seen.[34]

The multiple head approach   Another type of concrete morpheme approach holds that what appear to be distinct allomorphs are actually different heads in an articulated structure. Although similar to the subcategory approach in many ways, this way of structuring the analysis highlights some additional points of interest beyond those considered in 4.1.

There are some different ways in which this idea can be implemented. Continuing with past tense allomorphy, a first pass is shown in (43). The basic idea there is that the 'past tense' is in fact produced by the three features [+x], [+y], and [+z]; in turn, each of these is concretely associated with a different form. I have placed these heads in a specific order for reasons that will become clear below.

(43)   Multiple Tense heads

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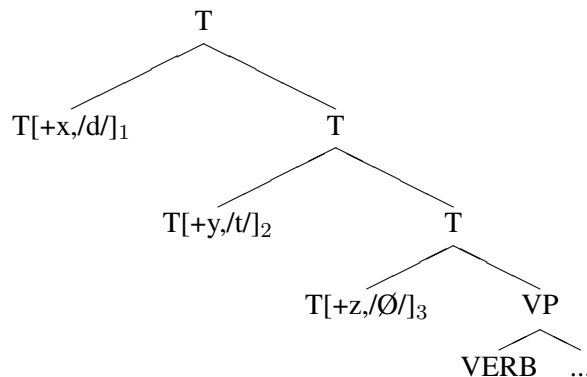
[33]The same kind of question about additional syntactic movement arises in phrasal interactions as well; e.g. VP fronting:

(i)   a.   Mary ben-t the iron bar.

       b.   Mary said she would bend the iron bar and [bend the iron bar she did].

Ellipsis is similar: *Mary bent an iron bar and then Susan did*.

A related consideration connects with the discussion of when morphemes are 'invisible', which I touched on in §3.3. The trees used for *played* and *bent* in (41-42) above are quite simple: they omit the Voice and v heads (and perhaps others) that are standardly posited below T. I employed these representations so that the point about T-subcategories selecting different verbs could be illustrated clearly. If these heads are part of the syntax of the clause, some principle must specify why T can select a particular set of verbs 'though' them (and why other heads– e.g. Negation– do not appear to be transparent in this way).

[34]Having Selection operate in a syntax with morphemes that head phrases makes incorrect predictions in some relatively simple cases involving affixation. In verbs like *out-bend*, for example, T would select the head pronounced as *out*, not *bend*, predicting **out-bend-ed*.
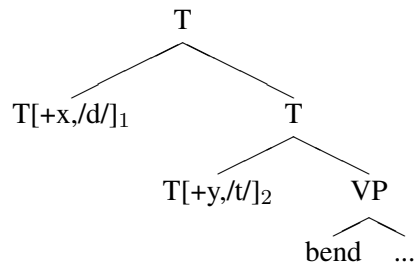
Collins and Kayne (2020) propose something similar to (43), in which not all of the heads T_1-T_3 would be present in any given clause. This puts it in someways in between the subcategory approach (where the T heads are in complementary distribution) and the approach embodied in (43). Some reasons for moving to this kind of position will be seen below.[35]

The approach employing (43) is concrete in the sense that is at the heart of this section: the form of the different morphemes in (43) is linked crucially to their distribution. When we consider further details, though, it becomes clear that this appearance is deceiving: in order to implement blocking, this analysis needs to introduce a type of contextually-determined pronunciation: i.e., Late Insertion.
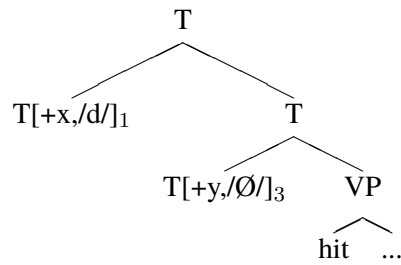
The basic idea is that the contextual effect exhibited by Tense derives from which of the three heads in (43) is pronounced. The details of what is required to make this happen reveals some connections with the last section, and some new points of interest as well.

A first question is how T_2 sees the verbs it occurs with (*bend* etc.), since it selects T_3. A fix would be to say that when T_2 is present, T_3 is not, and vice versa. This puts T_2 and T_3 in a position to select the verbs that they are found with. That is:

(44) for /t/-verbs   (45) for /Ø/-verbs

```
            T                                    T
           / \                                  / \
          /   \                                /   \
  T[+x,/d/]₁    T                      T[+x,/d/]₁    T
               / \                                  / \
              /   \                                /   \
     T[+y,/t/]₂   VP                      T[+y,/Ø/]₃   VP
                  /\                                   /\
              bend  ...                            hit  ...
```
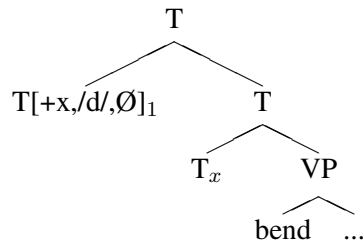
This approach makes some correct predictions. Suppose that while T_2 is present with *bend* and friends, T_3 is found with every other verb in the language. This will derive *play-Ø-ed*, *walk-Ø-ed*, and so on. Generalizing, it is predicted that T_1 should be insensitive to verb identity for reasons of locality: i.e., it does not select the verb because one of the other T's is always in the way. This is an interesting outcome. But further reflection shows that this approach has serious problems as well. In particular, this account fails to predict the basic patterns of blocking that must be part of any complete analysis. Crucially, the T_1 head must not be pronounced when T_2 is present (to prevent **ben-t-ed*); it must also not be pronounced with certain T_3 verbs (cp. **hitt-Ø-ed* and the like). Collins and Kayne recognize this issue, and offer an account of the 'overt/zero' alternations that is problematic; it seems to appeal to a kind of ban on 'double marking' that is shown to be incorrect in Halle and Marantz's (1993) discussion of blocking in Anderson's (1992) theory.

In any case, the most important point to be drawn from this is not about how the mechanics of selection might be played with to produce blocking; it is about the general properties of the theory that would result. What I have in mind is that getting the blocking to work properly in (43) results in the T_1 head having two possible forms, as shown in (46) where T_x stands in for either T_2 or T_3:

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[35]See also Marantz *https://wp.nyu.edu/morphlab/2022/06/13/the-revenge-of-phrase-structure-rules/* for some comments on their specific proposals.

(46)   Two forms for T_1

```
                    T
                  /   \
       T[+x,/d/,Ø]₁    T
                      /  \
                   T_x    VP
                         /  \
                      bend   ...
```

When it selects T_2, T_1 must be null. When T_3 is present, it is either /d/ or /Ø/. Determining how T_1 knows the difference between verbs like *hit* and *play* is a problem, since T_1 does not select the verb. But this is not the most interesting point. The upshot of trying to make this analysis work is that T_1 has distinct contextually-determined pronunciations. This means that it is not in fact a concrete morpheme whose syntactic distribution is associated with a unique phonological form. What we have, in other words, is a theory with abstract morphemes, in which the equivalent of Late Insertion (disguised as part of the theory of blocking) makes morphemes sensitive to their local contexts in a way that is ultimately responsible to their form.[36]

In short form, when pressed on how blocking works, the multiple head theory produces an argument that the analysis of allomorphy requires abstract morphemes and Late Insertion.

4.3   Discussion

Concrete morpheme theories predict the alignment of locality domains. The preceding sections look at two related ways of implementing a syntactic theory with morphemes of this type. The important feature they share is that a head's form plays a crucial role in defining its syntactic distribution. This property is the opposite of what happens in an abstract morpheme theory, where syntactic features alone determine distributions.

The theories considered above are faced with several serious difficulties. My discussion will first summarize and generalize on these difficulties, and then ask a different type of question concerning what kind of evidence would support a concrete syntax.

Selection and allomorphy   A starting point for thinking about concrete morphemes is the question of whether key interactions (allomorphy, allosemy) take place only under Selection. If it turned out that allomorphy occurred exclusively between morphemes that select each other, that would be a significant observation (and might e.g. motivate dwelling further on how some of the technical problems identified above could be fixed). However, there does not appear to be any reason to think that this is the case.

Beyond this very general point, there were two additional types of difficulty that emerge when the Selection-based accounts are developed. The first involves movement; this clearly has an effect on allomorphy (more precisely, on whether the contexts for allomorphy are derived); but it is not clear how to account for this in terms of Selectional relations. The second set of problems involves blocking. For the distinct-head approach in particular there are serious questions about how to

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[36]A mechanical fix to the problem in the text would be to hold that T_2 and T_3 are not in fact selected by T_1, but by another head T_4 that is null. However, it follows from nothing in the theory that a head like this that Selects 'irregular' allomorphs has to have no phonology. It would therefore be simply an accident whenever blocking obtains; surely an unwelcome result.

make this work; even in simple systems like the English past tense (the problems get even more serious as the number of overt allomorphs of a given head increases). Attempts to fix this problem appear to be either completely ad hoc, or to introduce Late Insertion through the back door by allowing a single head to have multiple pronunciations– the very thing that a concrete morpheme theory is supposed to disallow.

Independent syntactic evidence?   There is a very general kind of evidence that would support concrete syntax, and it is not one that has been sufficiently emphasized in existing discussions. A concrete morpheme theory requires distinct allomorphs to be distinct syntactic objects.The most direct evidence in favor of such an approach would thus be a demonstration that clauses containing e.g. *played* and *bent* are syntactically distinct; that is, evidence independent of the /d/ versus /t/ difference, involving constituency, ellipsis– something syntactic. The problem is that this is precisely what is (by definition) not supposed to happen when there is allomorphy. The *-t* and *-d* allomorphs are identical syntactically and semantically; as discussed earlier, the relevant past tense verbs differ (aside from lexical content) only at PF. Why, then, try to encode this difference in form in the syntax?

This question is not meant to be dismissal. It serves to highlight a question that is at the heart of any theory of contexts. In short form, it is not always clear whether a particular effect is an instance of allomorphy or of some other phenomenon. This is where the insistence upon different forms of evidence becomes crucial. To take an example, Kramer (2016) analyzes plural formation in Amharic, where plurals are realized in more than one way. Kramer presents a number of arguments for a 'split' analysis of pluralization: more specifically, the [+pl] feature can in principle be found on both on the nominalizer n, or on a higher number head Num. The differences in form are thus not typical allomorphy, but the result of the different locations in which [+pl] appears. This analysis of number is superficially similar to the multiple distinct head analysis of Tense above. But– crucially– there is evidence in Amharic for the split analysis of pluralization, unlike e.g. English Tense and other typical cases of allomorphy.

The point of these observations is to focus attention on exactly what a purely syntactic approach to allomorphy could hope to accomplish. It is true that concrete morphemes have an intuitive appeal, as I have mentioned more than once. But it is worth thinking carefully about the theoretical cost of sticking with them. This is where the question about independent syntactic evidence comes in; without this, syntactic treatments of allomorphy wind up using the syntax as a kind of diacritic, since the putative syntactic differences are relevant only to morphological form (to the extent that they can be made to work in the first place). It is not at all clear to me why this should be taken as a success for syntactic theory.[37]

In summary, looking for syntactic (or interpretive) correlates to differences in form is an important step in any analysis, and there are instances in which it clearly reveals featural or structural differences that correlate with different forms; that is, not true allomorphy. But there is solid evidence that true allomorphy exists. The existence of morphemes that are syntactically (and semantically) identical but pronounced differently is evidence for an abstract morpheme theory with Late Insertion. The burden is on the concrete morpheme theory to demonstrate either that

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[37]Realizational approaches that derive the effects of contextual allomorphy through hierarchies and realization-dedicated movement operations (cf. Caha this volume) are in the same boat on this point. In the absence of independent evidence for these representations and operations they are only morphological in scope, in spite of their syntactic appearance.

the premise is incorrect– i.e., that treating all apparent allomorphs as syntactically distinct makes correct predictions or is supported by other evidence– or that it is empirically superior to an abstract morpheme theory in terms of how it treats contextual effects. The discussion of this section suggests that such demonstrations are not likely to succeed, although it remains to be seen what form alternatives or extensions to the possibilities considered in this section might take.

5   Concluding remarks

This review is structured to emphasize the link between two main points::

- First, the idea that the grammar employs abstract morphemes;

- and second, the idea that Distributed Morphology provides a theory of locality that correctly defines the conditions under which morphemes may and may not interact.

In summary form, the idea is that different lines of research have converged on the idea that morphemes are abstract, and interpreted in context for both form and meaning. On the further assumption that they are assembled into complex objects in the syntax and interpreted at the interfaces, this leads to the expectation that both syntactic and interface-specific locality conditions should play a role in the grammar of contexts.

With this expectation in mind, I concentrated in section 3 on the types of locality conditions that have been argued to restrict interactions among morphemes. The current state of the art involves a relatively developed view of PF locality, and some proposals concerning what contexts for meaning might look like as well. One clear direction for future work is further development on the meaning side. It is an open question how many phenomena fall under of the theory of contextual interpretation. It appears to be the case that there is a distinction to be made between allosemy and idiomaticity, with corresponding locality differences (see Anagnostopoulou and Samioti 2014 and Marantz and Myler this volume). This move leads to a significant conclusion– viz. that there are (at least) two kinds of non-compositional meaning– and therefore warrants careful articulation and exploration.

On the PF side, a number of topics continue to be actively explored. When it comes to specific proposals concerning locality conditions or domains (and, with this, the question of what the these derive from), a look at the literature reveals a number of disagreements about the details. This fact should not, however, make us lose sight of some of the larger points of agreement. The largest of these is that there is some substantive theory of locality in the first place. The next in importance, in my view, is that there appears to be more than one type of locality condition interacting to produce contextual effects. If this latter point is correct, it vindicates one of the central intuitions that produced the theory of Distributed Morphology: viz., that the proper analysis of "morphology" involves representations and operations that are distributed across different parts of the grammar.

* * *

In concluding, I will offer a few thoughts that point to future research directions; these are general takes on first, the theory of PF that is summarized above, and second, the idea that the grammar employs abstract morphemes.

The nature of PF   How does the conception of PF outlined here (and its relation to morphology) relate to other theoretical possibilities? The question is worth dwelling on because of the frequently-encountered idea that it would be desirable to eliminate *morphology* or *the morphological component* or *PF operations* from the grammar. As I have said several times above, this intuition is clearly correct for part of what is at issue, where theories with concrete morphemes are in principle simpler than their abstract counterparts; it simply appears that the facts indicate that this is not how the grammar works. But what about PF more generally– is there a similar kind of intuition that should guide proposals there– one that should lead us to think that 'no PF' is a desideratum?

I do not believe that there is, beyond the sort of basic parsimony that is part of any theoretical enterprise. But the more interesting point concerns where the proposals summarized in this paper lie with respect to two extremes. It turns out to be somewhere in the middle, in a way that I think warrants attention.

One extreme would be minimalist (small 'm' on purpose), in the sense that it would have PF do as little as possible. This is not to say that PF can dispensed with. The function of PF as an interface is to connect language to external systems; i.e. systems of articulation/perception– where the language-internal representations are expected to play no role. No contemporary theory that I am aware of seriously considers the possibility that the syntax is converted directly into extra-linguistic phonetic representations (or 'neural instructions'; cf. Chomsky 1975:169). It is therefore simply an empirical question how much is involved in the process of externalizing syntax. Put slightly differently, even a concrete morpheme theory must employ some sort of phonological grammar for e.g. cases in which 'phonological word' and 'syntactic terminal' do not align, or for the construction of prosodic domains, and so on. Some sort of PF thus appears to be indispensable.

The other ('maximalist') extreme for PF is, as it turns out, associated with certain lines of thought in the Minimalist Program. Several recent works by Chomsky (e.g. Chomsky 2019) suggest that almost all of what has been previously treated as syntax is in fact the product of an extremely narrow syntax interfacing with language-external systems. One interpretation of what this means would put much of what is typically classified as narrow syntax at PF. The idea that this is an interpretation is important– in particular because it is not exactly clear how to connect this thesis with concrete empirical hypotheses (see Embick in prep. for an attempt). In any case, this kind of extreme, where PF also contains a kind of syntax, represents a clear opposite to the 'minimize PF' intuition in the last paragraph.

Most relevant for my purposes is how these extremes help to understand where current work in Distributed Morphology stands. It takes the position that PF is not trivial, in that it posits Vocabulary Insertion, and (in many versions) other PF operations as well. At the same time, it stops short of making PF a syntax (or a 'second syntax'), as it might be on one of the extremes. What is the end game for this kind of research program? In my view, identifying locality conditions (whether they produce an intermediate position or not) is a first step in a research program that takes on additional aspirations: in particular, having identified some set of such conditions, it may then be asked why the grammar makes use of those, and not some other set. This line of thinking brings the particular details of locality in grammar into contact with more general concerns, both conceptual (as in "Three Factors" discussions; e.g. Chomsky 2005) and those that link with other research areas (cognitive (neuro)science, e.g. Marantz (2005), Poeppel and Embick (2005),

Embick and Poeppel (2015)).

Why abstract-?   Though not as prima facie exciting as the extremes, an intermediate position (motivated by empirical arguments) can nevertheless be interesting. It might be discovered, for example, that the grammar functions in fascinating and unexpected ways, leading to the question of why it does that, and not and not something else. Abstract morphemes provide a case in point. Why would the grammar use these?

A comprehensive answer to this *why* question might seem quite distant; but it is possible to make some connections. The idea that morphemes are abstract is (or is one take on) the thesis that is referred to as the *autonomy of syntax*.[38] What I have in mind here is that the syntax manipulates abstract objects ([+past], v, etc.) in a way that is independent of their representations at the interfaces. These features are related to form and meaning, but types of representations are determined only in context; which is to say, the syntax is a computational system that operates on representations that are neither form nor meaning, but provides the crucial way of linking the two. The fact that the syntax operates purely abstractly in this way leads to a number of puzzles; why should grammars structure clauses the way they do?

The scope and correctness of the autonomy thesis were widely debated at one point in the history of the field. If the general line of argument summarized here is correct, the theory of morphology (in particular, the parts of it addressed here) produces an argument that the autonomy thesis is correct at least in this domain; in a syntactic approach like Distributed Morphology the implications are of course broader. At the very minimum, the abstract versus concrete discussion should rekindle interest in the more general set of questions that connect with the autonomy of syntax. In time we might begin to understand some of the different forms that an answer to the *why*-question might take, and investigate them; certainly an appropriate end-game for one stage of linguistic theory.

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[38]For the qualification, discussions like Chomsky (1975) is directed at meaning, and asks whether formal grammar (including syntax, morphology, and phonology) is autonomous from the core notions of semantics. The extension to form is an addition to this conception.

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