

Localism versus Globalism in Morphology and Phonology

David Embick
University of Pennsylvania

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Contents

1	Introduction: (Morpho)syntax versus (Morpho)phonology	1
1.1	Localism/Globalism; Serialism/Parallelism	2
1.2	(Phonologically Conditioned) Allomorphy	4
1.3	Surface Forms, Competition, and The Schism	6
1.4	Prospectus: A Localist Theory	8
1.5	Prospectus: Localism versus Globalism	14
1.6	Implications	18
Part I:	A Localist Theory	19
2	A Localist Theory	20
2.1	Syntax and Morphology	21
2.1.1	Basics: Types of Morphemes	21
2.1.2	Vocabulary Insertion	21
2.1.3	Linearization	22
2.1.4	Words/Terminals/Linearization	24
2.1.4.1	“Words”	24
2.1.4.2	Some Definitions	26
2.1.5	Phonological Form: Competition and Visibility	27
2.1.5.1	Competition	27
2.1.5.2	(Local) Visibility	29
2.2	Contexts for Allomorphy: Towards a Localist Theory	30
2.2.1	Cyclic Structure and Allomorphy	31
2.2.2	A \mathbb{C}_0 Theory	33
2.2.3	Generalizations about Allomorphic Locality	34
2.3	Implementation of the Localist Theory	35
2.3.1	Cyclic Spell Out: The \mathbb{C}_1 -LIN Theory	36
2.3.2	Application to Cyclic Heads	40
2.3.3	Transparency and Pruning	41
2.3.4	Synopsis	43
2.4	Vocabulary Items	43
2.4.1	Specification	43
2.4.2	Outwards Sensitivity	44
2.5	Potential “Long Distance” Effects	45
2.5.1	Contextual Allomorphy versus Impoverishment	45
2.5.2	Syntax: Features from AGREE	46

2.6	Core Predictions of the \mathbb{C}_1 -LIN Theory	47
3	Applications and Implications	50
3.1	Illustrations I: Visibility and Linear Intervention	51
3.1.1	Adjacent Heads in Latin Perfects	51
3.1.2	Some Latin Themes	55
3.2	Illustrations II: Cyclicity and Domain Effects	56
3.2.1	No Fusion in “Derivational” Morphology	57
3.2.2	Interactions with multiple cyclic heads	57
3.2.2.1	Hindi Causatives	58
3.2.2.2	Domain Effects in Stem Suppletion	61
3.2.3	French Prepositions and Determiners: A Question about Cyclic Heads	63
3.3	Case Studies: Inner/Outer Affixation	67
3.3.1	Preliminary Predictions: Japanese Causatives	68
3.3.2	Nominal affixes: The Outer Cycle	69
3.4	Morphology and Phonology	71
3.4.1	Competition for Insertion versus Morphophonology	71
3.4.2	Sensitivity to Phonology	74
3.4.3	An Illustration: Palauan Verb Marker Allomorphy	75
3.5	Conclusion to Part I	79
	Part II: Phonologically Conditioned Allomorphy	80
4	Phonologically Conditioned Allomorphy: The Globalist Intuition	81
4.1	Phonology/Morphology Relations	81
4.2	Allomorphy and Globalism	83
4.2.1	Phonologically Conditioned Allomorphy: The Globalist Intuition	84
4.2.2	Illustration and Implementation	85
4.2.3	Generalizing: <i>Phonological Selection</i>	86
4.3	Generalizations and Formal Predictions	86
4.4	Outline	88
5	On the Intuition behind <i>Phonological Selection</i>	90
5.1	Phonological Selection and Ordering Allomorphs	91
5.1.1	Haitian Creole Determiner Allomorphy	91
5.1.2	Djabugay Genitives	94
5.1.3	Interim Assessment	96
5.1.4	Systems of Allomorphy: Some Questions	96
5.2	Djabugay Case Allomorphy	97
5.2.1	Case Decompositions	100
5.2.2	Summary	102
5.3	Yidjñ Case Allomorphy	103
5.3.1	Preliminary View of the Cases	104
5.3.2	Morphophonological Interactions	106
5.3.3	(Re)analysis	108

5.3.4	Putting the Components Together	110
5.3.5	Phonological Selection Obscures Generalizations	111
5.4	Conclusions	112
6	Potentially Global Interactions are Resolved Locally	114
6.1	From Opacity Effects to Global Interactions	115
6.1.1	Opacity and Global Interactions	116
6.1.2	Over-/Under-application in Allomorphy?	117
6.2	Allomorphy and NL-APPLICATION	118
6.2.1	Turkish 3s Possessive	118
6.2.2	<i>NL-Application</i> : “Overriding” Local Concerns	119
6.2.3	A More Extreme (Hypothetical) Case	121
6.2.4	Local and Cyclic Interactions	123
6.2.4.1	Affix Placement in Huave	123
6.2.4.2	Saami	125
6.2.5	Some Comments on Cyclic OT	126
6.2.6	Interim Assessment	126
6.3	Case Study: Arguments for Global Optimization in Latin	127
6.3.1	Latin Perfect Allomorphy in the Second conjugation	127
6.3.2	Generalizations about Latin Perfect Allomorphy	130
6.3.3	Latin Verbs of conjugations III/III(i)/IV	132
6.4	Paradigm (Non-)Uniformity: Outwards-Sensitivity Redux	135
6.5	Summary	137
7	Discussion	138
7.1	The Program I: Competition, Localism, Cyclicity	139
7.2	The Program II: Patterns in the Data	140
7.3	Epilogue: Phonology without Morphology/Syntax?	141
	Notes	143
	References	154

Introduction: (Morpho)syntax versus (Morpho)phonology

Theories of grammar (and of language more generally) make specific claims about how the different facets of language are analyzed, often in ways that create partitions that are at odds with descriptive works, and, notably, at odds with each other. Although different theories propose very different models of the grammar at an architectural level, and the questions involved in distinguishing among competing theories are often quite subtle, the ultimate assessment of questions of this type is empirical. For example, there is no way of knowing based on conceptual or *a priori* considerations whether or not, e.g., “phonology” and “morphology” constitute one component of the grammar, or more than one. This is a question that has to be determined by taking specific models that make competing claims about these facets of linguistic knowledge, and by comparing the empirical predictions that these models make. While conceptual considerations about a particular type of explanation are discussed to some extent below—mostly to highlight why the empirical questions are the most important—it must be emphasized from the outset that the crucial comparisons are always to be found in the empirical predictions made by different theories.

The question that is central to this work concerns how the system (or systems) responsible for deriving and representing the syntactic and morphological properties of complex expressions is related to the system that computes the phonological form of these expressions. In terms that look ahead to the details that are examined below, this is the question of whether morphology is computed in the same system as phonology— in which case morphological and phonological computations could in principle interact globally with each other— or whether morphology and phonology are computed by distinct linguistic systems, organized serially in a way that restricts potential interactions.

This book is a sustained argument for the position that phonological form is computed in a way that is directly linked to the generative procedure responsible for creating complex expressions, and that (morpho)syntax and (morpho)phonology interact in a limited way that reflects the serial organization of these parts of the grammar. In the particular model of grammatical organization that I argue for, phonological computations apply after syntactic structures have been spelled out cyclically and processed morphologically. Morphological operations— in particular, those responsible for *allomorphy*, in which the phonological forms of morphemes are determined— are constrained by the cyclic organization of the grammar, and by the local domains that are defined by syntax and syntactic relations. The derivational properties of this approach thus place significant restrictions on potential interactions between morphosyntax and morphophonology.

This derivational view of grammar differs substantially from the prevailing view in phonological theory, where research is primarily concentrated on the development of *non*-derivational theories. The specific questions addressed in this monograph are part of the more general debate between derivational and non-derivational theories, initiated in the recent theoretical context with the development of Optimality Theory and other surface-oriented theories of grammar. This book approaches

the general debate between these opposing positions by looking at the phenomenon of allomorphy in natural language, a phenomenon that lies at the interface of morphosyntax and morphophonology. The central point is that allomorphic alternations provide decisive empirical evidence in favor of the derivational view.

Before the discussion advances to technical points, a note is in order concerning the connotations of some of the terms that are employed in this work. The debate between derivational and non-derivational theories has been at the center of some of the most significant and heated theoretical discussions in linguistic theory. In framing the particular questions that are addressed in this book, I will employ another set of general terms for describing the opposing theoretical positions to be examined. Because finer-grained classifications are called for, the opposing positions discussed below are cast in terms of *Localist* versus *Globalist* theories on the one hand, and *Serialist* versus *Parallelist* theories on the other. These terms are not as charged as *derivational* versus *non-derivational* are. They are used because they identify differences in theoretical approaches at a finer level of granularity than the *derivational* versus *non-derivational* distinction does. But the concession to greater detail that motivates this terminological choice— and the air of impartiality that might be associated with the new terms— should not mask the main line of argument of this book. The arguments that are presented here are part of the derivational versus non-derivational debate, and they come down squarely on one side. When morphosyntactic and morphophonological are examined carefully in the domain of allomorphy, the empirical evidence in favor of the Localist and Serialist view— i.e., for a strongly derivational model of grammar— is overwhelming.

1.1 Localism/Globalism; Serialism/Parallelism

This study focuses on two ways in which derivational approaches to phonological form differ from non-derivational approaches. In both types of approach the phonology characterizes the relation between abstract underlying representations, which consist of morphemes that are grouped into words and phrases by the syntax, and surface representations that are linear sequences of segments. In the derivational approach, this relation is characterized by a *series* of *local* changes, each of which typically involves a single target in an environment that is locally determined. In non-derivational approaches like Optimality Theory, by contrast, neither of these restrictions holds: the relation between underlying and surface representations is not defined as the result of changes that are applied serially in local environments. To highlight these differences between approaches, the derivational approach is referred to below as Localist/Serialist, and the OT alternative as Globalist/Parallelist.

In the contemporary theoretical context, the prevailing views in syntactic theory and in phonological theory offer strikingly different stances on the question of Localism/Serialism versus Globalism/Parallelism.

In syntactic theory, the Minimalist Program of Chomsky (1993) and subsequent work continues a great deal of earlier research in advancing a theory in which syntactic relations are inherently local. Particular emphasis in this approach is placed on the idea that derivations are serial. Each computational operation is given a step in a derivation, and these computational steps are ordered so that the output of one step is the input to the next. Serial derivation enforces a kind of Localism, by restricting the information that is available at any particular stage of computation. This program and the theories that derive from it are *Localist* and *Serialist* in nature.

The phonological theory of Chomsky and Halle (1968) is Localist and Serialist in the sense described immediately above. However, phonological theory is at present dominated by Optimality

Theory (McCarthy and Prince 1993, Prince and Smolensky 1993), which takes a *Globalist* and *Parallelist* view of the grammar. Optimality Theory dispenses with many of the assumptions of earlier generative phonology, in which an underlying representation is subjected to a serially ordered set of rules that effect local changes to the representation, and ultimately derive a surface form. The earlier (Localist and Serialist) view is replaced by an architecture in which an input form is paired with a set of potential surface expressions, where a system of ranked constraints selects the winner of this competition. A defining property of this Globalist and Parallelist type of view is that the factors that force a change in the output relative to the input need not be structurally close to the locus of the alternation.

Another defining property of Globalist theories like Optimality Theory is that morphology and phonology are not serially related to one another, but are instead computed in the same system. This architectural premise constitutes another departure from earlier models of phonological computation. In Chomsky and Halle's (1968) *The Sound Pattern of English* (SPE) and later versions of generative phonology, morphological processes are followed by phonological rule application. Although these distinct systems are interleaved in some theories (e.g. Lexical Phonology and Morphology, as in Kiparsky 1982), the ways in which they can interact are restricted by their serial organization.

The opposing positions defined by Serialism versus Parallelism and Localism versus Globalism are particularly acute in the domain of morphology, where current theories of (morpho)syntax and current theories of (morpho)phonology take positions that are incompatible with each other.

The morphosyntactic theory developed here, Distributed Morphology, takes a Localist and Serialist view of syntax and sound (and meaning as well), holding that phonology interprets the output of the syntactic derivation. In frameworks like Optimality Theory, as just mentioned, morphology and phonology are computed in the same system. It is thus predicted that phonological constraints may in some cases outrank syntactic or morphological constraints, such that the morphological properties of an expression could potentially be determined by output phonology, or by the global properties of surface forms, in ways that cannot be formulated in Localist and Serialist theories. This prediction is especially important in the domain of allomorphy, as will be made clear below.

While the theories discussed above differ in practical terms, in the sense that research in Distributed Morphology is more oriented towards syntax, and research in OT more oriented towards phonology, they overlap considerably in terms of what they seek to explain, and it must be asked directly why they differ so fundamentally. The opposing views of grammar hypothesized by these frameworks make for a sort of schism between (morpho)syntax and (morpho)phonology. To a first approximation, this schism suggests two possible outcomes to the research now in progress. The first is that one of the two theories is simply incorrect. The second is that they both are correct, and that morphosyntax and phonology are distinct and disconnected systems, in some profound sense. These are fundamental points, and progress can be made by comparing the different predictions made by Localist/Serialist and Globalist/Parallelist theories in key domains like allomorphy, where each has something to say.

Since the primary issue here is whether grammar functions in local terms, or whether at least some global considerations play a role in computation, the terms *Localist* and *Globalist* are used throughout the book for the two types of architectures just outlined. These headings refer both to different types of frameworks, as well as to specific theories that can be framed within these architectures. As the discussion unfolds, the specifics of different proposals are articulated.

In this monograph, the primary question that is addressed is whether there is a single computa-

tion in which the morphological form and phonological form of morphemes is determined simultaneously, with the potential for global interaction. Different types of Globalist answers can be framed to this general question. A *fully* Globalist theory of morphology and phonology would hold that the morphology and phonology of entire words is computed in a way that allows for interaction between structure, allomorphy, and sound; perhaps with syntax included in this computation as well (cf. McCarthy 2002:142). *Limited* Global interaction can also be implemented. For example, in stratal or cyclic versions of OT, only subparts of a given word are subject to simultaneous morphological and phonological computation (Kiparsky 2000 and subsequent work). While theories of this type rule out fully global interactions across entire words, they nevertheless predict that in a given cyclic domain, there should be global interaction among morphology and phonology.

In the course of examining specific theories below, the finer distinctions between full and limited Globalism are made when required. The overall point, though, is that theories with even limited global interaction between morphology and phonology make very different predictions from Localist theories about how phonology and morphology can interact, and this allows for a direct comparison of the different frameworks.

1.2 (Phonologically Conditioned) Allomorphy

This book examines the predictions that Localist and Globalist theories each make for *allomorphic* interactions. *Allomorphy* in the broad sense is a term that covers any variations in the surface form of a morpheme. Whether all such variations are the result of one type of operation in the grammar, or different operations, is something that different theories make different claims about.

As an initial example of allomorphy, consider the behavior of the past tense morpheme T[past] in English. According to a standard analysis, the default shape of this morpheme is *-d*, as in *play*, *play-ed*. As is well-known, the past tense morpheme has allomorphs besides *-d* which occur when T[past] occurs next to other verbs; putting aside changes in the phonology of the verb stem itself (such as *broke* from *break*), a rudimentary description is given in (1):

- (1) Allomorphs of T[past] in English
 - a. $-\emptyset$: *hit/hit- \emptyset* , *sing/sang- \emptyset* , *break/broke- \emptyset* , etc.
 - b. *-t*: *bend/ben-t*, *leave/lef-t*, *buy/bough-t*, etc.
 - c. *-d*: Elsewhere

Allomorphic interactions of this type appear to be highly constrained. Informally, for allomorphic purposes one node sees another only when the two nodes are “close” to each other in a way that must be made precise.

The kind of allomorphy exhibited by English T[past] is *grammatically conditioned*. Knowing whether a particular verb selects a particular allomorph from (1) is something that does not follow from other factors. In particular, it is not predictable from the phonology of the verb. Rather, the conditioning element is a locally visible, grammatical object; in the case of (1), the identity of the particular verb that the node T[past] is attached to.

This kind of allomorphy is called *contextual allomorphy*. Something in the grammar specifies that the pronunciation of T[past] has one of the non-default forms in (1) (i.e. either (1a) or (1b)) when it occurs in the *context* of a specific verb. Part of any theory of morphology is the theory of the conditions under which elements can show contextual allomorphy in this way. The first part of

this monograph develops a Localist and Serialist theory of allomorphy, in which linear adjacency and cyclic locality interact to produce a constrained theory of allomorphic interaction.

A second type of allomorphy, which allows for a direct comparison of Localist and Globalist frameworks, is *phonologically conditioned allomorphy* (PCA; see Carstairs 1988 and subsequent work). This is a type of contextual allomorphy in which the choice of a particular allomorph of some morpheme is determined by phonological factors. Some examples are given in (2):

(2) a. Korean nominative suffix

Allomorph	Env.	Example	Gloss
-i	/C__	pap-i	‘cooked rice’
-ka	/V__	ai-ka	‘child’

b. Seri passive suffix (Marlett and Stemberger 1983)

Allomorph	Env.	Example	Gloss
p-	/__V	-p-eši	‘be defeated’
a:ʔ-	elsewhere	-a:ʔ-kašni	‘be bitten’

c. Haitian Creole definite suffix

Allomorph	Env.	Example	Gloss
-la	/C__	liv-la	‘book’
-a	/V__	tu-a	‘hole’

These examples are chosen to illustrate different types of effects that are found in PCA, as viewed from the perspective of the output phonology of the affixed word.

The first case (2a), Korean *-i* and *-ka*, is a case where the distribution of allomorphs could be seen as having a phonological motivation. The vowel *-i* after consonants creates syllables that are “better” than those that would be created by affixing *-ka* to such forms, on the assumption that sequences of the form CVCV are preferred to e.g. CVCCV. Similarly, affixing *-ka* to vowel-final hosts avoids the hiatus that would be created by the affixation of *-i*. In this sense, it might appear that the “morphological” choice of allomorphs is driven by the output phonology, in a way that fits nicely with a Globalist phonological theory in which syllable-structure markedness constraints that favor CV- syllables without codas can effect allomorph selection.

The behavior of the Seri passive morpheme in (2b) is ambiguous. The prevocalic form *p-eši* supports the idea that affixation should produce sequences of an optimal kind. However, the preconsonantal forms like *a:ʔ-kašni* are not phonologically optimal. In terms of the phonological forms that the language happens to provide for the realization of the passive morpheme, however, the distribution of allomorphs could be seen as phonologically optimal; that is, while *a:ʔ-* does not produce optimal syllables with C-initial hosts, it produces better phonological forms than would be created by the affixation of *p-*.

Finally, the Haitian Creole allomorphy is “perverse” from the perspective of syllable-structure markedness. Affixing *-la* to consonant-final hosts creates syllable codas, and affixing *-a* to vowel final hosts creates hiatus between syllables. Both of these results are non-optimal, and both of these problems would disappear if the reverse distribution of allomorphs obtained.

Intuitively, the importance of PCA as a case-study derives from the fact that it involves the interaction of morphological and phonological factors in the determination of a form.

In the Localist theory developed in Part I of this monograph, all of the cases of contextual allomorphy seen above receive the same analysis. The theory says that the phonological “spell out”

of a morpheme, which occurs in a process called *Vocabulary Insertion*, can be sensitive to items that are in the local environment of the morpheme being spelled out. While this theory can account for the distributions in (2), it cannot say *within the grammar itself* that these distributions happen for a reason; i.e., that they are driven by surface phonological optimization. This theory can generate the forms that it derives mechanically, but it does so without reference to ultimate output forms; in this sense, it is a theory of morphology without teleology.

In Globalist theories like Optimality Theory, the architecture allows phonological constraints to determine allomorph selection. The reason for this is that morphology and phonology are one system, in which phonological constraints can outrank morphological ones. It is therefore possible in such theories to say that allomorph selection— part of the morphology— happens the way it does *because* of the way that affixation creates particular phonological patterns. In the Korean case (2a), for example, it is possible to give an analysis in which the candidates that are in competition consist of the host plus each of the different allomorphs, so that both e.g. *pap-i* and *pap-ka* are generated for the input “nominative of *pap-*”. The constraint ranking— and phonological constraints governing syllable structure in particular— then work together to derive the pattern of allomorph selection. In such a theory, it is possible to say *in the grammar* that the distribution of allomorphs is the way it is for a reason.

1.3 Surface Forms, Competition, and The Schism

Taking grammars to be theories of how sound/meaning connections are derived, it can be asked at a very general level what different theories have to say about the factors that may play a role in determining the surface form of an expression.

Optimality Theory implements Global and Parallel computation by generating an infinite set of output candidates for any given input, with constraints selecting a winner from these competitors. The output candidates differ from the input in ways that potentially involve more than one phonological “change”. This computation of forms is Global in at least two ways: first, because it is anti-modular, phonological and morphological constraints can interact in a manner that is not possible in alternative theories; and, second, because the constraints could be ranked in such a way that there are non-local interactions within a word.

The central principle that allows output forms to be compared for well-formedness is *competition*. Competition is a fundamental concept in some grammatical theories. It is implicated in morphological discussions in the study of *blocking* effects, initiated in the modern era in work by Aronoff (1976). According to Aronoff, for example, the word **gloriosity* is derived by the rules of the grammar, but cannot be the “abstract noun for GLORY” because *glory* exists and blocks it. In order for this analysis to work, the grammar must supply more than one object for the potential expression of a particular meaning (in this example, both **gloriosity* and *glory*), and it must supply a means of determining the winner of this competition.

Part of the OT program is based on the idea that surface forms are the way they are for a reason, and that the grammar must state these reasons directly. In order to implement this idea, competition is required. From the infinite set of possible output forms, the winner is the one that is optimal with respect to the constraint ranking. If there were not multiple competitors— i.e., if the grammar only made available one representation in any given computation— then there could be no “optimization”.

The potentially Global interactions mentioned above are a consequence of this type of infinite competition. The fact that phonological and morphological constraints interact to select a winner

means that in principle, phonological properties of surface forms could determine what happens morphologically, by forcing a particular affix to be selected because of its effects on the phonology of the whole word.

The Globalist perspective on phonological form is incompatible with the view of the grammar that is advanced in Localist morphosyntactic theories like Distributed Morphology. The prevailing view of “blocking effects” in the broad sense is that they require competition of the type outlined by Aronoff. More recent work argues that there is no blocking of the type discussed above; this is the conclusion presented in Embick and Marantz 2008 and Embick 2007a. These papers examine arguments for blocking among words and larger expressions, and conclude that there is no motivation for a competition-based analysis of such phenomena. Rather, put somewhat simply, what surfaces in the grammar is what is derived by the grammar; other putative competitors for a particular meaning are simply never derived, and therefore do not need to be blocked. In particular, on this view, the grammar of English does not generate **glorios-ity* any more than it creates **good-ity* or **bad-ity*.

According to the theory of Embick and Marantz (2008), competition is strictly local: it is restricted to the procedure that determines the phonology of a single node, the Vocabulary Insertion operation mentioned above. A consequence of this view is that there is no competition among complex objects; i.e. no word/word, word/phrase, phrase/phrase competition. In short, complex objects are assembled in syntactic structures, and this simultaneously accounts for how they are represented, and how they are distributed.

This Localist theory has consequences for phonological relatedness, especially the shared properties of *lexically related* forms like *plays, played*, etc., where it places a number of restrictions. Specifically, the theory says that the phonological form and phonological relatedness are determined by the following factors:

- Complex, lexically related forms are built in syntactic structures and contain the same Root.
- In a given structure (with a Root, and functional heads), a single output is derived; this output is what exists, and therefore what must be used in that grammatical context.
- Complex, lexically related forms share phonological material in a consistent way because they
 - are based on the same Root, which has a given underlying representation (UR)
 - appear in syntactic structures whose heads have consistent phonological expression (up to allomorphy)
 - the phonology involves the same rules/constraints (up to exceptionality that must be listed).

The particular restrictions imposed by these factors are directly related to the fact that this theory has no competition among complex objects. In the course of any derivation, only one object is produced. It is thus not possible to generate multiple competitors and select a winner based on properties of the output. This precludes, among other things, generating a word with all of the different allomorphic possibilities the language allows, and then choosing the winner on the basis of e.g. phonological well-formedness.

This Localist view stands in sharp contrast to some basic aspects of the Globalist program. The essence of Globalism as manifested in Optimality Theory is unlimited competition, and the essence

of competition is that there be multiple possible outputs for any given input. This is exactly what the Localist morphosyntactic theory says is impossible. Putting these different incompatibilities into focus, it is clear that these views of morphosyntax and morphophonology define a schism:¹

- (3) THE SCHISM: Globalist theories of morphophonology require competition between multiple potential expressions of a given input. According to the Localist morphosyntactic theory, this is impossible because the competitors are not derived by the grammar.

This monograph brings empirical arguments to bear on the large-scale architectural matters implicated by (3). As mentioned in 1.1, there are two possible outcomes that could stem from focus on the Schism, and each of them is significant.

The first possible outcome is that (morpho)phonology is simply profoundly different from (morpho)syntax. It is in principle possible to construct a theory in which each of the two views above is correct: i.e., “No Competition” is correct for morphosyntax, and then “Competition” is correct for morphophonology. In such a theory, the syntax and morphology operate in terms of local, serial derivations, but the output of this system in some part of the phonological computation involves multiple or infinite competitors, so that global considerations can play a role in the determination of surface forms. One question to ask is whether this would be a sort of “worst case” scenario, architecturally speaking, since it would divorce the system of combinatorics from the system for computing sound forms in an extreme way.

The second possible outcome of the schism is that either the Localist or Globalist theory is untenable; i.e. (i) that the “generative” Localist view of (morpho)syntactic theory is incorrect, or (ii) that the Globalist, competition-based theory of (morpho)phonology is incorrect.

These are large points, and they resonate with other aspects of grammatical theory in numerous ways.

This monograph is divided into two major components. Part I develops a Localist theory of allomorphy. Part II makes explicit comparisons of the predictions of Globalist theories with the core predictions of the Localist theory of Part I. The fundamental results are that the Localist theory of Part I makes correct predictions about allomorphy in natural language, and that the predictions of Globalist theories examined in Part II are not supported by the data.

1.4 Prospectus: A Localist Theory

Part I of this monograph articulates a Localist theory of contextual allomorphy. The defining property of this theory, a version of Distributed Morphology, is that patterns of contextual allomorphy are restricted by both phase-cyclic and linear notions of locality.

Contextual allomorphy in Distributed Morphology results from the operation of *Vocabulary Insertion*. This is a procedure by which morphemes in a syntactic structure are assigned a phonological form. I assume that morphemes are terminals in a syntactic structure. Some of these morphemes, the functional heads, have no phonological form as part of their underlying representation. Rather, these morphemes receive phonological content in the PF (Phonological Form) component of the grammar. This is the role of Vocabulary Insertion; individual *Vocabulary Items* (VIs) compete for insertion at a given node, and the most specific that can apply gives that node its phonological matrix.

In the example of the English past tense, the syntax generates a structure that contains the past tense node T[past]. In the PF computation, the Vocabulary Items in (4) compete for insertion into this node:

(4) Vocabulary Items for Tense

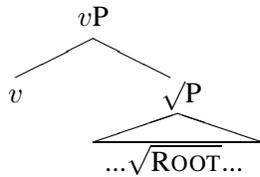
$$\begin{aligned} T[\text{past}] &\leftrightarrow -t/__ \{\sqrt{\text{LEAVE}}, \sqrt{\text{BEND}}, \dots\} \\ T[\text{past}] &\leftrightarrow -\emptyset/__ \{\sqrt{\text{HIT}}, \sqrt{\text{SING}}, \dots\} \\ T[\text{past}] &\leftrightarrow -d \end{aligned}$$

When Roots like $\sqrt{\text{BEND}}$ and $\sqrt{\text{HIT}}$ are present, the Vocabulary Insertion process inserts $-t$ and $-\emptyset$ into the T[past] node respectively; in other cases, the default $-d$ is inserted.

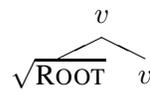
The general research question that motivates this work centers on the factors that play a role in contextual allomorphy. According to the view that is developed below, possible patterns of allomorphy are determined by the interaction of two distinct (and independent) sets of locality constraints. The core intuition is as follows: contextual allomorphy, where one node X can see another node Y for the purposes of Vocabulary Insertion, is possible only when X and Y are concatenated; i.e., in the most local *linear* relationship possible. In addition to this linear condition, a further set of restrictions on allomorphic locality are imposed by the assumption that syntactic derivation proceeds in terms of *phases* (in the sense of Chomsky 2000, 2001) that are spelled out cyclically. Phase-based derivation places sharp constraints on the amount of information that is available in a particular cycle of PF computation, and restricts potential allomorphic interactions accordingly.

The key elements of this proposal can be outlined in a few steps, beginning with the cyclic (phase-based) aspect of the theory. For cyclic derivation, the theory presented below assumes with Marantz (2007) and Embick and Marantz (2008) that *category-defining* heads like v , n , and a define phases. According to this view, heads of this type *categorize* the elements that they attach to. So, for example, a head v which is merged syntactically to a \sqrt{P} headed by a category-neutral $\sqrt{\text{ROOT}}$ creates a vP (5); when the Root and the v head are combined into a single complex head as shown in (6), the result is a “verb”:

(5) v merged with \sqrt{P}



(6) Complex head



The category-defining heads are *cyclic* in the sense of phase theory. What this means is that when they are merged to a structure, they trigger *spell out*: the operation that sends part of the syntactic structure (to be defined below) to the interface components PF and LF. Other heads that appear in complex words, such as tense morphemes, plural morphemes, etc., are not cyclic in this way. This difference between cyclic and non-cyclic heads is manifested in many domains, including possible allomorphic interactions.

The example in (5-6) shows a single cyclic head v attached to a Root. Category-defining heads may also be merged to structures that are already categorized. So, for example, a verb like *break*, which is a Root combined with v , may be combined with a “potential” adjective head a to yield *breakable*, an adjective derived from a verb, as shown in (7):

(7) $[[\sqrt{\text{BREAK}} v] a]$

When a category-defining head is the first that is merged with a Root, as is the case with *v* in (5) and (7), this head is said to be Root-attached, or in the *Inner* domain. When a category-defining head is attached to a structure that has already been categorized, like the *a* in (7), the additional cyclic head is said to be in the *Outer* domain.

A central idea in linguistic theory is that cyclic domains define possible interactions in syntax, phonology, and semantics. One proposal that has been discussed in the literature is that syntactic configurations in which a Root is merged with a category-defining head– the Inner domain– appears to be special for the purposes of both sound and meaning. In the formulation of Embick and Marantz (2008), the generalizations about what is special about this inner domain are as those in (8):

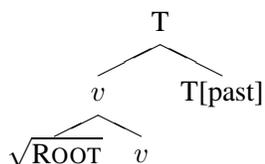
(8) Cyclic Generalizations

- a. **Allomorphy:** For Root-attached *x*, there may be special allomorphy, determined by properties of the Root. A head *x* in the Outer domain is not in a local relationship with the Root, and thus cannot have its allomorphy determined by the Root.
- b. **Interpretation:** The combination of Root-attached *x* and the Root might yield a special interpretation. The heads *x* attached in the Outer domain yield predictable interpretations.

For the purposes of a Localist account of allomorphy, what (8a) highlights is the possibility that contextual allomorphy could be found only with Root-attached cyclic nodes.

An important discovery in this context is that a “Root-attached” theory of contextual allomorphy is too restrictive. This point was discussed with reference to allomorphy in participles in Embick 2003, and arises in cases like the English past tense as well. English past tense verbs have a structure consisting of a Root, a *v* head, and the node T[past]:

(9) English Past Tense



The T[past] node shows contextual allomorphy, yielding the familiar allomorphs in e.g. *ben-t* and *hit-Ø* versus the default *-ed* in e.g. *play-ed*. Crucially, the T[past] node is not Root-attached, but nevertheless shows irregular allomorphy conditioned by the Root, contrary to what is predicted by (8a).

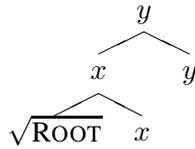
The conclusion that emerges from examples of this type is that the most restrictive phase-cyclic account of allomorphy (8a) is incorrect. The challenge is therefore to present a theory that is capable of accounting for the attested patterns of contextual allomorphy, while nevertheless being restrictive enough to make strong empirical predictions.

Part of the work presented in Part I sharpens the empirical questions that are at the heart of this discussion. While the type of case represented by the past tense example shows that a head outside of the Inner cyclic head may show Root-determined allomorphy, the possibilities for allomorphic interaction are still restricted in significant ways. The restrictions are of two types.

First, it appears that a morpheme can show contextual allomorphy determined by another morpheme only when these two pieces are linearly adjacent to one another; i.e., when no overt morpheme appears between the two. This generalization suggests a strict linear constraint on allomorphic interactions.

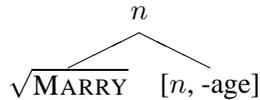
Second, although the cyclic theory based on (8a) is too restrictive, cyclic structure is still relevant for allomorphic interactions. This is clear from another fact: it appears that Outer cyclic heads cannot show contextual allomorphy that is determined by elements in the domain of an Inner cyclic head. So, for example, in a “category-changing” structure with two cyclic heads x and y like (10), the Outer cyclic head y never shows Root-determined allomorphy:

(10) Structure with two cyclic heads

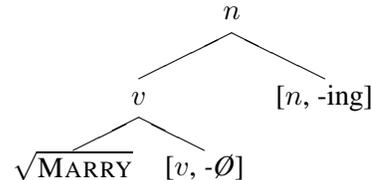


An example of this is provided by English gerunds, like *John’s destroying the files*. Unlike special nominals, like *laugh-ter*, *marr-iage*, *destru-ct-ion* and so on, where nominalization involves different suffixes (i.e., a great deal of Root-determined allomorphy), gerunds always take the suffix *-ing*: *laugh-ing*, *marry-ing*, *destroy-ing* etc. In special nominals, the n head realized as *-ter*, *age*, *-(t)ion* etc. is Root-attached. In Gerunds, on the other hand, the nominalizing n morpheme attaches to structure that is verbalized by v . The structures at play here are those in (11) and (12):

(11) *marriage*



(12) *marrying*



The Outer n seen in (12) shows no Root-determined allomorphy: it always has the phonological form *-ing*, even though it is superficially adjacent to the Root. This pattern seems to be completely general: that is, there are evidently no cases in which an Outer cyclic head shows Root-determined allomorphy.

There is thus an asymmetry between non-cyclic and cyclic heads in allomorphy: Outer non-cyclic heads can see across an Inner cyclic node, but Outer cyclic heads cannot. These important generalizations are schematized in (13), where lower-case x , y are cyclic heads, upper case Z is a non-cyclic head, and α represents the element that conditions the allomorphy:

(13) a. ... α] x] Z]

Generalization: Non-cyclic Z may show contextual allomorphy determined by α , as long as x is not overt

b. ... α] x] y]

Generalization: Cyclic y may *not* show contextual allomorphy determined by α , even if x is not overt

The asymmetry in (13) presents a basic empirical challenge for a restrictive theory of allomorphy: not only must the cyclic theory be extended to allow the (13a) cases; the extension must be executed in such a way that Outer cyclic heads in (13b) cannot be sensitive to elements in x 's complement.

The theory of Part I proposes that the key generalizations are accounted for by a theory based on the hypotheses (H1) and (H2):

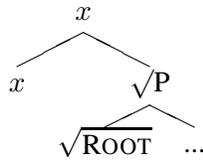
(H1) Contextual allomorphy is possible only with elements that are concatenated.

(H2) Cyclic spell out domains define which nodes are present in a given cycle of PF computation, and thus potentially "active" (capable of being referred to) for the purposes of contextual allomorphy. In some cases, superficially adjacent nodes cannot influence each other allomorphically because in terms of cyclic spell out, they are not active in the same PF cycle.

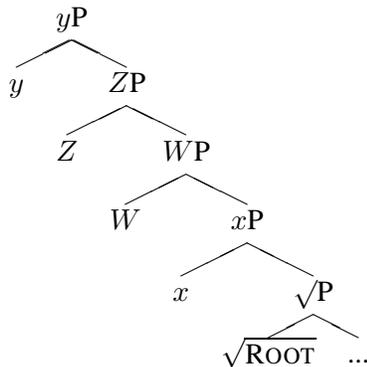
The linear condition in (H1) is straightforward: it holds that one node can only show contextual allomorphy determined by another node when the two are immediately next to one another; i.e., when there is no intervening morpheme.

The essential properties of the cyclic part of the theory (H2) can be illustrated with reference to (14) and (15), where lower case x and y are cyclic heads, and upper case W , Z are non cyclic heads; (14) shows the constituent structure prior to affixation, and (15) the complex heads that are created in the structures in (14):

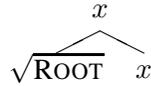
(14) a. Structure 1



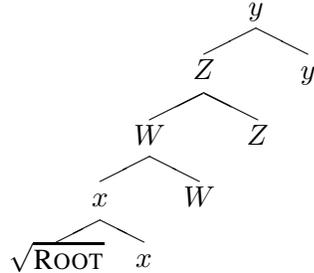
b. Structure 2



(15) a. Complex head created in Structure 1:



b. Complex head created in Structure 2:



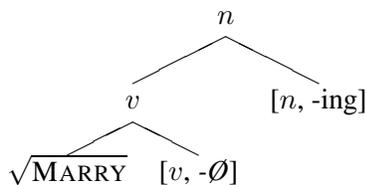
The basic premise of the theory is that cyclic heads trigger spell out; in particular, when a cyclic head is merged, it triggers the spell out of cyclic domains in its complement. With reference to (14)/(15), this means that when x is merged syntactically in (14a), there are no cyclic domains in the complement of x , so that there is no spell out in this particular case.

A subsequent step in the syntactic derivation merges non-cyclic W and Z . When the head y is merged, the spell out of cyclic domains in y 's complement is triggered. In this example, this means that the cyclic domain headed by x is spelled out, and, in particular, that a PF cycle is run on this cyclic domain. The cyclic domain headed by x includes the Root, x , and the non-cyclic heads W and Z . In this cycle, Vocabulary Insertion occurs at x , W , and Z , and gives phonological form to these morphemes. Since all of these heads are co-present in the same PF cycle, any one of these heads could potentially show Root-determined allomorphy, as long as no overt morphemes intervene.

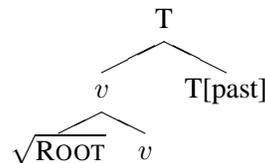
Later in the derivation, another cyclic head (not shown in (14)/(15)) triggers spell out of material in its complement, which includes the phase centered on y . The elements that are present in this PF cycle are x (the *edge* of the xP phase), W and Z , and y . Crucially, while y could show contextual allomorphy determined by x , W , or Z , it could not show Root-conditioned allomorphy. The reason for this is that the PF cycle in which y is given phonological form does not involve the Root; it (and other elements that could be in the complement of x) are derivationally closed off.

The principles just outlined account for the asymmetries in (13) above. This point can be seen by comparing the structure for a Gerund with that of a past tense form:

(16) Gerund *marrying*



(17) English Past Tense



When the n head in (16) undergoes Vocabulary Insertion, it is in a PF cycle that does not contain the Root $\sqrt{\text{MARRY}}$. Thus, this outer cyclic head cannot show Root-determined allomorphy. In the past tense structure in (17), on the other hand, the $T[\text{past}]$ head undergoes VI in a PF cycle in which

the Root is present. Thus, this head can show Root-determined allomorphy, as long as it is linearly next to the Root.

The cyclic aspect of the theory restricts the amount of information that is available to condition allomorphy in two ways. First, in a complex word that contains multiple cyclic domains, the computation of the phonological form of inner domains takes place at a stage when “outer” material is not present. This outer material can therefore play no role in determining the phonological form of inner nodes. Second, for computation on outer cyclic domains, certain parts of the inner material are inaccessible, because they are closed off in the way outlined above. As a result, there are cases when outer cyclic nodes cannot be influenced by certain nodes in the inner domain, restricting potential allomorphic interactions further.

In sum, the guiding insight of the theory presented here is that the interaction of (phase) cyclic domains and a strict linear notion of locality are responsible for possible patterns of contextual allomorphy. Reflecting the interaction of cyclic and linear factors, the approach that is advanced in Chapter 2 is called the “ \mathbb{C}_1 -LIN” theory, where the \mathbb{C}_1 stands for the cyclicity condition, and LIN stands for the linear condition.

After developing the details of this theory in Chapter 2, a number of illustrations and consequences of the approach are presented in Chapter 3. This includes a discussion of (linear) Intervention Effects, and cyclic Edge Effects, along with a series of more complex case studies examining how “the same” pieces of morphology can appear in different cyclic domains. Some comments concerning how morphosyntax and morphophonology interact in the theory are also presented, paving the way for some aspects of the comparison of frameworks in Part II.

1.5 Prospectus: Localism versus Globalism

Part II of this book returns to the fundamental tension between Localist morphosyntax and Globalist phonology outlined earlier in this chapter, by looking at the empirical predictions that these theories make for allomorphy.

Returning to some of the themes introduced in the first part of this chapter, the morphosyntactic theory developed in Part I of the book restricts competition in the grammar to allomorphy of a single node: this is the process of Vocabulary Insertion. The theory thus disallows competitions in which multiple competitors like “words” are derived and compared for well-formedness. This effectively restricts the factors conditioning a case of contextual allomorphy to elements in the immediate context of the node being spelled out.

This view differs fundamentally from that offered by a Globalist theory of the type that is assumed in much current work on phonology. In a theory like Optimality Theory, in which the grammar generates an infinite number of candidate expressions that are potential surface realizations of a given input, the inputs involved are complex; i.e., they involve more than one morpheme. Thus, this theory is responsible for morphology as well as phonology. Since morphological and phonological properties are determined in the same computational domain, this type of framework allows for global interactions in which, for example, non-local properties of surface forms play the defining role in allomorphic selection.

The full range of predictions that separate the Localist and Globalist views on allomorphy emerge from an examination of the following closely interconnected questions:

- GLOBAL MORPHOLOGY/PHONOLOGY INTERACTIONS: Is there evidence that morphology

and phonology are computed in a single, Global/Parallel system (*Global-MP*)? Or do the facts on interaction suggest an organization in which phonology acts on the output of allomorph selection, as in the Localist theory?

- PHONOLOGICAL SELECTION: Is there *Phonological Selection*, in which surface phonological well-formedness forces a choice among allomorphs, such that phonology drives allomorphy in ways that are impossible in a Localist theory?
- GLOBAL CONSIDERATIONS OVER LOCAL: Is there evidence that the factors determining allomorphy are global in any sense? I.e., are there cases in which Localist and Globalist approaches make different predictions about which allomorph should be chosen for a particular position, and the Global considerations win out, in a way that cannot be stated in a Localist theory?

Part II of the monograph begins in Chapter 4 with the answers to these questions that derive from Globalist theories. The discussion centers on the types of arguments that could, conceivably, provide evidence for such an architecture. While the emphasis in this discussion is on empirical arguments, some steps are taken to frame the important issues with reference to conceptual arguments that are to be found in the literature. As discussed above in 1.2 with regard to the initial examples of allomorphy from Korean, Seri, and Haitian Creole, a Localist theory cannot say that a pattern of allomorph selection arises *because* of some output property, phonological or otherwise. To the extent that there are generalizations about surface forms to be made, the Localist theory can make them, but they must be derivative of another part of language in the broad sense. That is, the explanations cannot be part of the grammar in the narrow sense, but are instead the result of diachrony, acquisition, etc.

As noted in 1.2 above, these considerations lead to a kind of conceptual argument that is often advanced in favor of Globalist theories. In theories of this type, it is possible to say that patterns of allomorphy happen *for a reason*, within the grammar. So, for example, the case of Korean *-i/-ka* allomorphy can be treated in terms of syllable structure constraints. An OT analysis can then say that the (phonological) grammar forces the attested distribution of allomorphs, and, moreover, the grammar *explains* the distribution by having morphological selection driven by optimization of the phonology of the output. The charge that is levelled against Localist theories is that, while they might account for the distribution of allomorphs, they do not provide (within the grammar) a reason for the distribution. This type of argument against Localist theories is based on their *Putative Loss of Generalization*, or PLG. In the domain of phonological rules, the question of whether Localist theories are missing generalizations about outputs has been actively discussed since at least Kisseberth 1970. The same kind of considerations about patterns in surface forms motivate Globalist views of morphology/phonology interactions, and allomorph selection in particular.

In many cases that have been studied in the literature, Localist theories and Globalist theories are both able to account for the facts. In such cases, only conceptual arguments, such as appeal to PLG, can be deployed against a Localist theory; there is no empirical basis for determining which of the two frameworks is to be preferred. Rather, the choice reduces to whatever combination of conceptual, aesthetic, or other factors regulate the intuitions that individual researchers have about what explains what. Such non-empirical arguments are not decisive. A key point that moves the argument presented here from the conceptual to the empirical is that Globalist theories predict a number of types of global interaction that simply cannot be expressed in the Localist theory. The direct comparison of frameworks must be directed at such cases.

The examination of these predictions goes in two steps. Chapter 5 begins by outlining the best case scenario for Globalist theories: the hypothesis that the phonological grammar determines all cases of Phonologically Conditioned Allomorphy (PCA), and nothing more needs to be said about allomorph distribution. This position was shown to be incorrect in early works exploring the Globalist research program like Kager 1996. However, the possibility remains that there are nevertheless *some* instances in which surface phonology drives allomorph selection, in ways that cannot be analyzed in a Localist framework.

In order to highlight the empirical issues, and the motivation behind the Globalist program, Chapter 5 then moves to an examination of *systems* of PCA. This part of the discussion is not a formal argument against Globalism or for Localism. Rather, it examines the intuition that Globalist theories are based on: the idea that patterns of PCA are the way they are for reasons that should be expressed in the grammar, and that these reasons should be phonological in nature. The empirical basis for this chapter is provided by systems of case endings found in two Australian languages, Djabugay and Yidij, where there is a large amount of PCA. Although examining isolated subparts of such systems might make it look like there is motivation for a Globalist theory in which output phonology determines allomorph selection, this impression is shown to be illusory once the systems are analyzed in detail. The particulars of the analysis show that the case systems in these languages derive from the interaction of stored information about the shape of morphemes with (sometimes exceptional) phonological and morphological rules, in a way that implicates serial organization between morphology and phonology. A further argument, extending this, is that although at a first glance Yidij case allomorphy looks as though it might be driven by simple phonological constraints, analyzing the system in surface-based terms obscures key generalizations about other aspects of the language's morphophonology.

Chapter 6 is centered on the fact that theories with even a restricted form of Global interaction between morphosyntax and phonology predict effects that cannot be stated in a Localist theory. These effects can be seen in cases in which a morpheme X has more than one phonologically conditioned allomorph, say x_1 and x_2 , and X appears in words with other morphemes like Y and Z :

(18) Root- X - Y - Z

There are cases of this type in which the *local* environment predicts insertion at X of the x_1 allomorph, while the *global* environment— i.e., phonological properties of the entire word— predicts insertion of the x_2 allomorph.

In a Localist theory of the type developed in Part I, choice of allomorph at X must be determined by grammatical or phonological information that is visible at the point when insertion occurs. Thus, the Localist theory predicts that in cases like (18), the locally-selected x_1 allomorph will be found.

On the other hand, in a Globalist theory in which morphology and phonology are computed in the same system it is possible for the x_2 allomorph to be inserted, in a way that is driven by the output phonology. This prediction is not the exclusive property of “full” Globalist theories. Even restrained, cyclic Globalist theories make the same prediction, as long as the affixes in question are not in different strata. That is, the prediction that Z 's form (or the form of the entire word) could affect allomorphy at X is made by any theory in which the computation of the morphophonology of X , Y , and Z occurs in the same domain.

The allomorphy of perfect heads in certain Latin verbs, discussed in Mester 1994, provides an example of the type schematized in (18). The perfect head in question has two allomorphs: $-u$,

generally taken to be the default, and *-s*.² Mester’s argument is that choice among these allomorphs is determined by the prosodic structure of affixed words. Specifically, the non-default *-s* allomorph is inserted only when the *-u* allomorph creates a form with an unfooted medial syllable, called a (medial) *trapping* configuration. The idea is that the prosodic undesirability of trapping is what drives the insertion of the non-default *-s* allomorph with certain verbs.

The effects of this analysis are shown for the verbs *monēre* ‘warn’ and *augēre* ‘grow’ in (19). These verbs differ in the metrical weight of the stem (light *mon-* versus heavy *aug-*), which results in different metrical parses with the *-u* affix. As seen in (19a) versus (19b), these verbs show different allomorphs of the perfect head:

- (19) a. Perfect Allomorph: *-u* with light Root
 [monu]⟨ī⟩
 b. Perfect Allomorph: *-s* with heavy Root
 *[au]gu⟨ī⟩ (trapping)
 [aug]⟨sī⟩

According to the Globalist theory advanced by Mester, the perfect morpheme has its allomorphy determined by the output prosody of the word. The grammar generates both *auguī* with the default *-u* allomorph, and *augsī* with the *-s* allomorph, and prefers the latter because of its surface phonological form.

In this case, the Globalist theory predicts—unlike the Localist theory—that the allomorph choice for the perfect may vacillate, depending on the phonological properties of outer affixes. In this particular case, the Globalist theory predicts that in pluperfects like those in (20), the allomorph selected for *augēre* should switch from *-s* to *-u*, because this yields a better prosodic structure (20b). In fact, this does not happen; the grammatical form has the *-s* allomorph as in (20a), in spite of the fact that this creates trapping:

- (20) 1s Pluperfect of *augēre*
 a. With *-s* allomorph:
 augseram = [σ̄]σ̄⟨σ̄⟩
 b. With *-u* allomorph:
 *augueram = [σ̄][σ̄σ̄]⟨σ̄⟩

In this and other cases, the locally determined allomorph is selected, and there is no evidence for the type of Global interaction— allomorph vacillation based on output phonology— that would provide evidence for Globalism.

The general line of argument in Chapter 6 is that any sort of interaction of the type outlined above would be an argument for a Globalist view, but that no such interactions are found. In cases where this type of prediction can be seen, languages show local determination of allomorphs of the type that is predicted by the Localist theory.

As stressed above, the differences in predictions between Globalism and Localism are clearest when a “fully” Globalist position— i.e., one with interacting syntax, semantics, phonology, etc.— is considered, but cyclic theories with limited global interaction also make predictions that go beyond what the Localist theory allows. The arguments advanced in this monograph extend to theories with even highly restricted forms of global interaction: there is no evidence for global interaction in even the restricted form that could be stated in a cyclic OT theory.

1.6 Implications

Chapter 7 synthesizes the consequences of Parts I and II of the monograph. If the Localist theory of Part I is correct, then allomorphy is subject to strict locality conditions of a type that derive from a Localist syntactic theory.

If the conclusions of Chapters 5 and 6 are correct, then there is nothing beyond cyclic and linear locality in the grammar of allomorphy; in particular, there are no empirical arguments for the strong predictions of Globalism. This point has implications for the status of generalizations about surface forms, along the lines of what was discussed under the heading of *Putative Loss of Generalization* above. In order to account for why certain patterns of allomorphy occur, a theory must have global interactions between morphology and phonology. It is only in such a theory that the grammar can refer to properties of output forms in the allomorph selection process. However, theories with this type of globality make formal predictions about morphology/phonology interactions that are not borne out. Taken as a whole, the facts discussed here thus constitute an argument against the Globalist architecture *and* an argument against the idea that the grammar itself must say why certain patterns of allomorph selection are found.

A second implication of this argument is that OT is a theory of phonology without a theory of morphology. There are many different potential responses to this line of argumentation, and almost all of them have deep consequences for theories of grammar. One obvious response would be to hold that there are fundamental differences between morphosyntax and (certain aspects of) phonology, and OT is a theory of the latter. Another possibility is that the type of Globalist system espoused by OT must be abandoned, or modified in some extreme way. Importantly, since incorrect predictions about allomorphy appear to arise even in systems with a limited amount of Global interaction, appealing to stratal or serial versions of OT either does not appear to be an adequate response, or results in a theory that is essentially Localist and Serialist in nature.

The central importance of cyclicity, locality, and serial organization is a theme characterizes that this entire work. These are, of course, the central principles that emerged in early work in generative grammar, and I take this work to show empirically that these notions must be at the heart of the theory of morphology/phonology interactions, and grammatical theory more generally. The particular emphasis in this monograph is on allomorphic phenomena, but the results presented here have ramifications that go beyond this area. While it would always be possible to try and avoid the conclusions of this work by, for example, holding that part of phonology is “special”, my view— a research intuition— is that the success of the Localist theory of morphosyntax and morphophonology motivates a return to a phonological theory in which the sound form of complex expressions is linked as closely as possible to the generative procedure that builds them. This work is a step towards making this intuition concrete.

Part I: A Localist Theory

A Localist Theory

This part of the book develops a theory of allomorphic locality that is centered on the interaction of cyclic and linear locality domains. This theory is developed as an account of a number of empirical generalizations that are presented in the course of the discussion. If something like this theory is on the right track, then morphology and phonology show the kinds of properties that are expected in a Localist view of grammatical architecture. In particular, if the key generalizations about allomorphy in natural language can be explained in a theory with sharp locality conditions, and do not require a theory that makes reference to e.g. competing forms, or to the phonological properties of outputs—things that could be referred to in Globalist architectures— then this is support for a Localist view. This part of the book presents the details of a Localist view, but does not make explicit comparisons with Globalist alternatives; the latter comparison is undertaken in Part II.

The theory of allomorph selection that is developed in these chapters is part of a Localist, Serialist theory of grammar. An important aspect of this theory, a version of Distributed Morphology, is that the syntax generates hierarchical structures that are subjected to further computations in the interface components PF and LF.

I assume that the syntax operates in terms of locality conditions that arise from cyclic derivation. A further assumption, one that is automatic in a syntactic approach to morphology like the one advanced here, is that conditions on locality in syntax also define behavior in the interface components. By reducing at least a certain amount of morphological interaction to cyclic derivation, this theory follows a long line of earlier theories, originating with the theory of the transformational cycle in Chomsky and Halle's (1968) *The Sound Pattern of English* and other pioneering works in generative phonology.

The basic empirical question that is addressed in this and the following chapter concerns the conditions under which a node may have its phonology determined by items in its context; i.e.:

- (1) LOCALITY OF ALLOMORPHY QUESTION: For the contextual allomorphy of some node, what factors in the environment of that node are visible?

Given the architectural premises of the theory that I assume, the key theoretical questions center on how morphological effects are determined in a system that has (i) cyclic derivation, (ii) structural (i.e. hierarchical) relations determined by the syntax, and (iii) linear relations derived from the hierarchical structure (in the PF component of the grammar, by hypothesis). It is important to distinguish (i-iii) in this way because conditions stated in terms of cyclic, hierarchical, and linear representations enforce conditions on locality that are in many cases distinct from one another. The relations that are important for different types of effects in morphology broadly speaking could thus be defined in different ways, and, ultimately, empirical evidence must determine which of (i-iii) (or a combination) is active for any particular phenomenon.

The theory that is presented below explores the idea that a kind of strict *linear* adjacency is

required for contextual allomorphy, in a way that interacts with a cyclic theory of what is “active” at a particular stage of a derivation. The central idea is that a node can be sensitive to another node for the purposes of allomorphy only when the two nodes are linearly adjacent to one another. There are, however, cases in which surface linear adjacency is not enough, and this is where cyclic structure plays a role: it is only when two nodes are present in the same PF cycle that they may potentially interact. The cyclic and linear notions of locality appealed to in this theory are logically independent of each other. It is an empirical hypothesis of this work that these two distinct types of locality interact to account for attested patterns of allomorphy in natural language.

2.1 Syntax and Morphology

The theory presented here is a piece-based, syntactic theory of morphology; Distributed Morphology, along the lines of Embick and Marantz (2008) in particular. Complex expressions are built out of discrete pieces (morphemes), and it is in the syntax (or in terms of relations derived from syntactic structures) that the composition of morphemes takes place. A further fundamental component of the theory is the idea that morphology is *realizational*. This means that at least some morphemes possess no phonology as part of their basic representation; rather, phonological material is added to such morphemes in the PF component of the grammar, after they have been combined in syntactic structures.

2.1.1 Basics: Types of Morphemes

The syntax creates complex objects out of different types of morphemes, the *Roots* and the *functional morphemes*, corresponding for the most part to the lexical and functional categories of syntactic theory:

- (2) Terminals
 - a. **Functional Morphemes:** Terminal nodes consisting of (bundles of) grammatical features, such as [past] or [pl], etc.; these do not have phonological representations.
 - b. **Roots:** Members of the open-class or ‘lexical’ vocabulary: items such as $\sqrt{\text{CAT}}$, $\sqrt{\text{OX}}$, or $\sqrt{\text{KICK}}$.¹

The Roots are assumed to be category-neutral. They are categorized in syntactic structures by *category-defining* functional heads: *v*, *n*, *a*, etc., to yield “verbs”, “nouns”, and so on. A further assumption is that these category-defining heads are cyclic in the sense of phase-theory; see below.

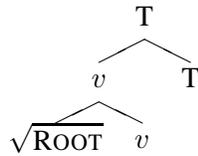
The morphemes in (2) are the primitives of syntactic derivations. In the course of such derivations, complex objects are built in the narrow syntax, and then spelled-out, i.e., subjected to a further series of computations in the interface components. While the nature and number of the computations that comprise PF are a matter of ongoing research, at a minimum, the theory holds that certain nodes must be given phonological content via the process of *Vocabulary Insertion*.

2.1.2 Vocabulary Insertion

As noted above, it is assumed that the functional morphemes have no phonology as part of their basic representation. When such morphemes occur in a syntactic structure, the process of Vocabulary Insertion adds phonological material to them in the PF component of the grammar. As an initial

illustration, (4) shows the *Vocabulary Items* (VIs) for the past tense head T[past] in English, which are competing for insertion into the T[past] node in (3):

(3) Structure



(4) Vocabulary Items for Tense

T[past] ↔ -t/___ {√LEAVE, √BEND, ...}
 T[past] ↔ -∅/___ {√HIT, √SING, ...}
 T[past] ↔ -d

The VIs are objects stored in memory. When they apply to a node in a syntactic structure, the phonological matrix that is part of the VI– the *exponent*– occurs in the position of that node.²

There are two important assumptions about how this process works. The first is that the items are ordered (see Halle 1997 for one view); the other is that nodes may be phonologically instantiated only once:

(5) Properties of Vocabulary Insertion

- a. **Ordering:** VIs are ordered (according to specificity, in the normal case).
- b. **Uniqueness:** Only one Vocabulary Item may apply to a terminal node.

Taken together, (5a,b) enforce a competition for the realization of the phonological form of functional morphemes. In principle, more than one VI in (4) could apply to a T[past] node, and which one actually applies is determined by ordering. When a more specific VI wins out over less-specified ones, the other potentially applying VIs are precluded from having an effect, such that *blocking* occurs.

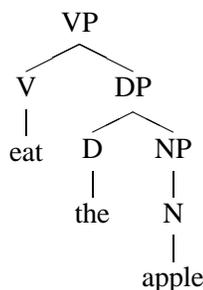
2.1.3 Linearization

It is assumed for present purposes that syntactic structures contain only hierarchical information. Thus in a hypothetical structure like [X YP], which results from applications of syntactic Merge, the linearization procedure could produce either a structure in which X precedes YP, or a structure in which X follows YP.

When structures like [X YP] are interpreted by the PF component, information concerning the linear order of elements in this phrase marker must be added to the representation. There are different kinds of information that figure in linear order. At the level of categories, information about linear order may be relatively abstract. For example, in a head initial language, a VP like [V DP] is ordered so that the verb precedes the DP, whereas in a head-final language, the opposite order is derived. Thus, part of what is involved in linearization involves generalizations about categories and their headedness. In linearization representations of this type, the operative factor is a set of statements that encode generalizations that go beyond the properties of individual terminals.³

Making this concrete, I assume a linearization procedure along the lines of Sproat (1985) and related work (see e.g. Marantz 1984,1988). As an initial example, consider the assignment of linear order to the VP in the sentence *John wants to eat the apple*. Simplifying so that V and N are used in the place of *v/n-√ROOT*, the syntax generates the following structure:

(6) Structure



When this structure is interpreted at PF, the first stage of the linearization procedure makes use of the information that verbs precede their complements in English (the same thing occurs within the DP as well, where D precedes its complement).⁴ It then assigns to the PF representation of this VP a statement that encodes this in terms of the binary *-operator, which can be read as ‘is left-adjacent to’:

(7) (V * DP)

As mentioned, there are corresponding statements for the DP, in this case (8):

(8) (D * NP)

In effect, these are representations in which the bracketing provided by the syntactic derivation is retained; the added information in terms of * concerns whether particular elements are to the left or to the right of other elements in the structure. While this information is shown in terms of individual statements above, the information provided in these *-statements could also be presented in one statement like the following:

(9) (V * (D * NP))

As noted above, the generation of *-statements of this type orders elements at a relatively abstract level. By ordering heads with respect to phrases (or phrases with respect to phrases), *-statements contain one type of information necessary for the ultimate linearization of a structure. Many alternatives to the one outlined here— such as deriving precedence relations— could be employed, and these alternatives might have consequences for particular phenomena.⁵ However, it is not clear that these alternatives have direct implications for allomorphy, and I therefore do not consider other formulations.

Beyond the information that head and phrases are next to one another, a more specific type of information must be present in the PF derivation: specifically, the terminal nodes must be *concatenated* with one another. In this work, *concatenation* refers to a representation that is exclusively linear. While * encodes that the V is next to the constituent containing D and NP— i.e., that it is to the left of the DP— there must be an explicit statement of which head in the DP the V is immediately adjacent to. Continuing with the example from above, this can be thought of in the following way. The information that V is left-adjacent to the DP is represented, and this must ultimately lead to the statement that V is to the left of the first element of the DP, whatever that may be. What this means is that V is directly concatenated with the first node inside of the DP, which in this example is D. In order to be clear about this, in this work the concatenation of terminals is represented with \frown ; this is a binary operator that encodes immediate precedence. Thus for the example above, the following statements of concatenation are derived:

- (10) $V \frown D$
 $D \frown N$

Finally, concatenated elements must be “chained” into a linear representation that can be employed by the input/output system. I will have little to say about the representations implicated in chaining here; I will assume without argument that the chained representation is something like (11c), where the dash – is used as a general-purpose boundary symbol. While these statements do not play a role in the discussion below, they have been implicated in other domains, notably, in the locality conditions on “prosodic” phonological rules; see in particular Pak 2008.

Putting things together, then, we have the following linear representations for the VP in question:

- (11) a. Linear relations by *: (V * DP), (D * NP)
 b. Linear relations by \frown : $V \frown D$, $D \frown N$
 c. Chained: V-D-N

In the spirit of the Localist character of the framework, it is assumed that these different representations are derived sequentially in the PF component. It is possible that distinct stages with * and \frown operators might not be necessary for the full set of generalizations that implicate linear relations at PF. From the perspective of the present investigation, what is important is that the PF component contain representations in which terminal nodes are concatenated with each other. While other aspects of this concatenation operator might be crucial for e.g. post-syntactic reorderings (cf. the discussion of affixation under adjacency in Embick 2007b), what is important for allomorphy is immediate precedence, and I focus on this below.

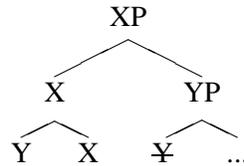
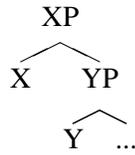
2.1.4 Words/Terminals/Linearization

The discussion of allomorphy below is, for the most part, devoted to “word-internal” cases of allomorphy. This calls for some clarification, since the theory of Distributed Morphology does not have a primitive notion of “word”. Rather, the theory makes available an inventory of primitive elements (the morphemes in (2)) and a set of procedures for (i) combining these objects syntactically (syntactic Merge), and (ii) combining heads into *complex heads*.

2.1.4.1 “Words”

I assume that the theory of constituent structure provides a way of deriving objects in which multiple syntactic terminals have been combined into the same, internally-complex head. The “packaging” of heads in this way is something that correlates with standard phonological definitions of wordhood, at least, to a first approximation. So, for example, when two terminals X and Y are not combined in a complex head, these nodes constitute a two-word or “analytic” expression, and, when put together, a one-word or “synthetic” expression:

- (12) Analytic “two words” (13) Synthetic “one word”



One way of forming complex heads like in (13) is with the operation of head movement. As has been discussed elsewhere, it appears that, in addition to head movement (assumed for convenience to be part of the syntax), there are operations that affix terminals to each other to create complex heads in the PF component (see e.g. Embick and Noyer 2001 for one view).

When there is a synthetic realization like (13), the overwhelming majority of cases show the phonological characteristics of “word level” phonology.⁶ It is for this reason that, in an informal way of speaking, when the heads are packaged as one complex head they are “one word”, whereas terminal nodes realized as separate heads are “two words”.

Overall, then, the theory proposes that the difference between “words” and “phrases” in this theory is not architectural; it has to do with how the terminals in a syntactic structure are assembled. Importantly, the “special domains” for various types of interaction, whether involving sound or meaning, do not correspond to the informal notion of “word” employed above. Rather, they are defined in terms of cyclic structure. For one version of this view, see Marantz (2007) and the discussion of 2.2.1.

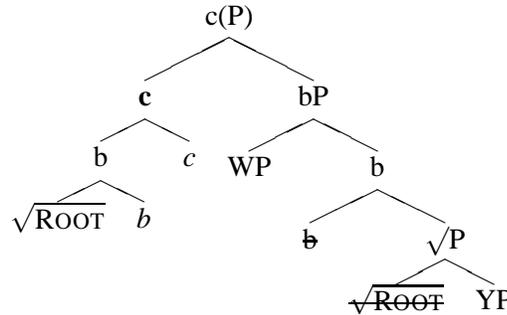
In addition to the role played by cyclic structure, it appears that structural relations like “complex head” have some relevance to the phonology as well. As mentioned above, the basic generalization is that objects created by affixation, i.e., by the creation of complex heads, behave as phonological words, or, more cautiously, show “close” phonological connections. Moreover, certain phonological processes, such as “word-final devoicing”, target the word boundary in the informal sense that is intended here, indicating that there is a connection between the “complex head” in syntactic terms, and the domains required for phonological rule application. Beyond this rough characterization, however, there are many additional cases of interest that must be examined. For example, the phonological behavior of elements internal to compounds is not identical to that of non-compounds, despite certain similarities in terms of structural properties. In addition, asymmetries in the morphophonological behavior of certain (classes of) affixes might in some cases reflect important structural differences, while in other cases the phonological differences might result from the diacritic properties of particular exponents (as discussed by e.g. Halle and Vergnaud (1987)).

Looking at the larger picture, the general goal within the kind of approach outlined here is a theory of the connections between domains of phonological interaction on the one hand, and structural configurations on the other. A fundamental question is which aspects of phonological behavior are reducible to (cyclic) structure and which are reducible to properties of individual exponents. For some research along these lines, see e.g. Marvin 2002 and Arregi and Oltra-Massuet 2005 for “word-internal” investigations, and for larger objects, Wagner 2005 and Pak 2008.)

2.1.4.2 Some Definitions

Returning to the PF relations relevant for allomorphy and other effects, the linearization procedures outlined above are general in the sense that the same operations apply both to heads, as in the examples above, and within complex heads. These points are clear in the context of a hypothetical structure like (14):

(14) Hypothetical Structure



What (14) represents is a structure typical of head movement, in which a Root moves to functional head *b*, with the resulting complex then moving to functional head *c*.⁷ Structures like this with complex heads implicate the manner in which the PF component employs different *types* of objects, such as those defined in the two-level ontology of Embick and Noyer (2001) (see also Embick 2007b):

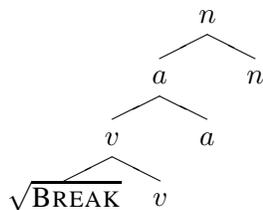
(15) Definitions

- a. M-Word: (Potentially complex) head not dominated by further head-projection
- b. Subword: Terminal node within an M-Word (i.e. either a Root or a bundle of morphosyntactic features)

Illustrating with reference to (14), boldfaced *c* is an M-Word, while italicized *b*, *c* are Subwords. The theory of typing discussed in Embick and Noyer (2001) and Embick (2007b) holds that M-Words enter relations with respect to other M-Words, and Subwords with other Subwords.

The concatenation of M-Words was illustrated above. Within a head, Subwords are concatenated with other Subwords. This is illustrated this with reference to the word *breakability*, which has the hierarchical structure in (16):

(16) Structure



Here *-statements are derived as described above, and then statements of concatenation, so that (16) has the statements in (17) assigned to it:

$$(17) \sqrt{\text{BREAK}} \hat{v}, v \hat{a}, a \hat{n}$$

(surface: break-Ø-abil-ity)

Thus, the linear order of M-Words and Subwords is computed in the same way.⁸ Notationally, concatenation of Subwords is represented with the operator \oplus in the works cited above. In the discussion below, it is primarily word-internal allomorphy (i.e., allomorphy internal to the M-Word) that is at issue. Since little hinges on the notational conventions in many of these cases, I will employ $\hat{}$ for Concatenation in most of the representations below, with finer distinctions made only when necessary.

2.1.5 Phonological Form: Competition and Visibility

As highlighted in Chapter 1, what is ultimately at issue in comparing the predictions of Localist and Globalist theories is the range of factors that may determine the phonological form of an expression. The theory of Distributed Morphology in the form advanced in Embick and Marantz 2008 involves two specific points that are crucial to the comparative discussion to be undertaken; one about *competition*, and one about *visibility*.

Each of these points connects directly with the theory of allomorphic interactions. Competition is important for reasons outlined in the first chapter. In order for a theory to implement the proposal that surface forms are optimized phonologically, so that phonological outputs can be compared for the purposes of e.g. allomorph selection, it must be the case that the grammar generates multiple competitors and compares them.

According to the Localist theory adopted here, allomorph selection cannot make reference to output phonology, or to any factors that would require competition among complex forms. Rather, the possible factors in determining allomorphic competitions (and in determining phonological form more generally) must be definable in terms of cyclic, hierarchical, and linear notions of *visibility*, within the confines of a single derivation.

2.1.5.1 Competition

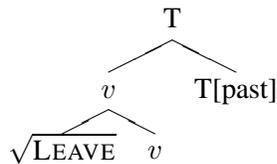
Above, it was noted that Vocabulary Insertion involves competition that derives from the assumptions in (5), which holds that VIs are ordered, and that only a single VI may apply to a given node. The status of competition in the grammar in general is the central issue discussed in Embick and Marantz 2008. The theory of blocking presented in that paper allows for extremely limited competition: in particular, it is only the underlying representation of individual morphemes that is subject to competition. In terms of the framework presented above, competition is restricted to the process of Vocabulary Insertion, in which the phonological form of a single morpheme is determined. There is therefore no competition among complex objects in this theory:

- (18) NO COMPETITION (AMONG COMPLEX OBJECTS): The theory does not allow the generation of multiple potential expressions of a given meaning. Rather, derivations produce one output per input. There are no complex objects in competition; rather, competition is restricted to Vocabulary Insertion at one node.

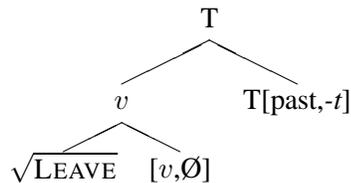
What this means can be illustrated with reference to the past tense example that is employed above to illustrate the basics of VI in (3-4). When the syntax generates the structure of e.g. “past

tense of the verb *leave*”, this involves a complex head like (19) in the PF component of the grammar; when the list of Vocabulary Items is consulted, the one with the exponent *-t* must apply to the node T[past], as in (20):

(19) Structure



(20) Post Insertion



Crucially, it is only at the T[past] node that there is competition. The winner of the competition is the VI with the exponent *-t*, and the fact that this VI wins means that the VI with the exponent (orthographic) *-ed* loses. Even though the VI with *-ed* loses this particular competition, this object nevertheless is part of the grammar; it wins (is part of a grammatical derivation) in the case of e.g. *play-ed*, etc.; the “regular” verbs of English. So, if $\sqrt{\text{LEAVE}}$ were not on the list for the VI with the *-t* exponent, the VI with *-ed* would apply. It is in this sense that the VI with *-ed* is blocked by the VI with *-t* when Roots like $\sqrt{\text{LEAVE}}$ are present.

While the VI with *-ed* is part of the grammar, and it is blocked in the derivation of *lef-t*, the hypothetical form **leav-ed* does not have this status. It is not part of the grammar in any form, because the rules of the grammar do not derive it. Another way of putting this is that while *-t* blocks *-ed* in the context of $\sqrt{\text{LEAVE}}$, *left* does not block **leaved*, since the latter is not generated.

The theory of Embick and Marantz 2008 advances this “local competition” view of blocking by showing that putative competitions between words and words, or between larger objects (as in e.g. Poser 1992, Andrews 1990, Bresnan 2001), are better analyzed as not involving competition. This position is defended with respect to “canonical” cases of blocking, such as the *glory*/**gloriosity* relationship from Aronoff 1976. Beyond this, moving to the level of what look like “word/phrase” interactions, or *Poser Blocking* (Poser 1992), it is not the case that *more intelligent* blocks **intelligent-er*, nor is it the case that *smarter* blocks **more smart* (see also Embick 2007a). Instead, the syntax derives a structure that either may or may not provide the structural description for a rule that affixes the comparative element to the adjective. When this rule applies, a synthetic form like *smart-er* is the result; when it does not apply, an analytic form like *more intelligent* is pronounced. In neither case is there any need to block “losers” like hypothetical **more smart* and **intelligent-er*; like in the case of **leav-ed*, the grammar does not generate these objects.

In each of the cases examined to this point, there is a single principle that accounts for the derivation of the grammatical forms. The rules of the grammar are set up to generate e.g. *lef-t* and *more intelligent* respectively. There is no way of building the “ungrammatical” objects **leav-ed* and **intelligent-er*. Thus, they do not have to be blocked, because they are not built in the first place. The general principle that does the important work in this kind of analysis is the one in (21):

- (21) Apply computation K when Structural Description of K is met.

The general principle is, informally, RULES APPLY. This principle in (21)– together of course, with the rules of the grammar of the language– defines what exists and what is grammatical.

This view of competition has direct consequences for what may exert influence on the derivation of phonological forms, and thus for the theory of allomorphy, and (morpho)phonology more generally. The theory holds that what exists is what is derived, as per (21). In this way, the amount of information that is available to condition the insertion of a contextual allomorph is restricted to what has been produced at an earlier stage of the derivation.

A consequence of this view is that it is not possible to analyze allomorphy by having the grammar generate all possible host-allomorph combinations, and then blocking all but one (optimal) winner from among this set. In this way, the theory differs fundamentally from the perspective offered by Optimality Theory, in which complex objects (words, for example) enter into competition. In a standard OT grammar, both *lef-t* and *leav-ed* are “derived” in the sense that they are surface forms that GEN delivers for the input “past tense of LEAVE”; the constraint system must then be configured so that *lef-t* wins, rendering **leav-ed* ungrammatical. The general property of this type of theory is that multiple complex competitors for a given input can be derived, so that, most pertinently, different host-allomorph combinations can be derived and compared on a number of parameters. This type of comparison is impossible in a theory that bans competition among complex objects; as discussed in Part II of this book, the different types of frameworks (Localist, no competition versus Globalist, full competition) theories make a number of distinct predictions about allomorphy that can be tested empirically, predictions that derive to a large extent from the opposing positions such theories take on competition in the grammar.

Another set of restrictions arise from another facet of this framework, the position that derivations are *encapsulated*, in the sense that there are no transderivational relations. Thus, it is not possible to say that allomorphic choice is influenced by other parts of an element’s paradigm, or by the paradigms of other words, etc.; all such “paradigmatic” considerations are banned from playing a role in well-formedness (this point has been examined with respect to syncretism in Bobaljik 2002).⁹

2.1.5.2 (Local) Visibility

A theory with the properties outlined in the last section allows the following factors to play a role in the computation of a complex form’s phonology (see also e.g. Bobaljik 2008, with reference to certain Globalist, paradigmatic claims of McCarthy (2005)):

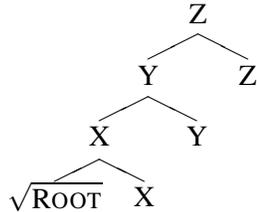
- (22) a. Identity/Phonological forms of Roots and morphemes
- b. Locality (phases, linear adjacency)
- c. Phonological processes
- d. Things that have to be listed: allomorphy, exceptions, Readjustment Rules

In order to interact within the confines of what is allowed by (22), elements in a derivation must be visible to each other. The theory of what is locally visible in PF representations begins with the notion of cyclicity. There are two notions of *cyclic* that are at play in the determination of morphological and phonological form in the present framework. The first is an “inside-out” kind of cyclicity, which takes the form of the assumption that VI applies to the most deeply-embedded node in a structure first, and then targets outer nodes successively (see the discussion in Carstairs 1987, Bobaljik 2000, Carstairs-McCarthy 2001,2003, Adger et al. 2003). The second kind of cyclicity is

phase-based in the sense of Chomsky 2000,2001, and Marantz 2001,2007 (see also Marvin 2002 and Bachrach and Wagner 2006 for some phonologically-oriented proposals).

The first type of restriction can be illustrated in the abstract with reference to the structure in (23):

(23) Structure for Root-X-Y-Z



The working hypothesis of “inside out” cyclicity is that Vocabulary Insertion targets the node X first, then Y, then Z. This ordering has the potential to restrict the amount and type of information available for particular instances of VI. So, for example, insertion at Y could be sensitive to the output of insertion at X, but not to the output of insertion at Z. While the assumption that VI functions in this way does not seem to follow from any other aspects of the theory, it is well-motivated empirically and it will be retained here (see in this connection Bobaljik 2000).

The second type of cyclic restriction is hypothesized to derive from phase-based cyclicity, in the sense of Chomsky 2000,2001 and related work. Within a given derivation, objects may interact only if they are active (i.e., co-present) in the same cycle of computation. As discussed below, this type of cyclicity appears to play a role in allomorphic interactions as well.

2.2 Contexts for Allomorphy: Towards a Localist Theory

The theory of contextual allomorphy in Distributed Morphology is, in effect, a theory of suppletion. Contextual allomorphy is found when a single morpheme like T[past] for past tense T, or [pl], for plural, has (i) more than one exponent; and (ii) the different exponents cannot be derived from one another via the phonology. The allomorphs are thus suppletive alternants of each other. This is the case in, for example, the English [pl] head, which has (orthographic) *-s*, *-en*, and *-∅* allomorphs (this example is employed here instead of the past tense, since an additional point about phonologically derived allomorphs can be considered):

- (24) #[pl] ↔ -en/{√OX, √CHILD, ...}__
 #[pl] ↔ -∅/{√MOOSE, √FOOT, ...}__
 #[pl] ↔ -s (=z/)

The competition for insertion at the #[pl] node is waged between the three VIs in (24). In a given derivation, only one may be employed. A result of this competition– and the fact that there is more than one possible “winner” for the expression of plural when the language as a whole is viewed– is that the node #[pl] has three suppletive allomorphs.

In the kind of competition described immediately above, there are distinct VIs at play. This sort of *competition for insertion* can be distinguished from another sense in which the term *allomorphy* is sometimes employed. Continuing with the plural example, it is clear that not all surface realizations

of the orthographic *-s* allomorph are phonologically identical; rather, there are /z/, /s/, and /əz/ “allomorphs” that surface in phonologically predictable contexts (in e.g. *dogs, cats, churches*). This type of “allomorphic” effect is not suppletive, and within the theory outlined above it is not treated via competition between distinct VIs with /z/, /z/, and /əz/ exponents. Rather, this pattern is found when (i) the morphology (VI) inserts *-z/*, and (ii) the (morpho)phonology derives from this single exponent the different surface forms seen above.

As a general point, I use the term *allomorphy* (respectively, *phonologically conditioned allomorphy* when the conditioning factor for suppletion is phonological) for cases that involve competition among VIs.

The general theme of this work is that allomorphic relations are constrained to obey certain locality conditions. This means that while Vocabulary Items must be specified so that they make reference to objects in their context, not any object in the syntactic structure may be referred to. Put somewhat abstractly, the initial question that must be posed is as follows: for a VI like (25), which encodes contextual sensitivity of the morpheme $[\alpha]$ to X , what the relation represented by \sim can be:

(25) *Locality*:

$[\alpha] \leftrightarrow -z/X \sim \underline{\quad}$

In a framework like the one assumed here, (25) asks which structural or linear relationships can appear in a Vocabulary Item. The theory proposed below holds that the relation symbolized by \sim in (25) is *concatenation*, \frown in the discussion of linearization in 2.1. In addition to this, the cyclic component of the theory restricts possible allomorphic interactions further, by circumscribing the set of cases in which nodes like $[\alpha]$ and X are actually operated on in the same cycle of PF computation.

2.2.1 Cyclic Structure and Allomorphy

I assume that the syntactic component of the grammar is derivational, and that derivations operate in terms of cyclic domains in the sense of Chomsky (2000,2001) and related work. The natural move in a theory with cyclic locality domains is to assume that the significant domains for (morpho)phonological and semantic interactions are identical to syntactic “phases”; this is the type of theory presented in Marantz 2001,2007, which takes category-defining heads like *v, n*, etc. to define cyclic domains in this sense:¹⁰

(26) Category-defining heads *n, v* are *cyclic* heads.

This means that the functional vocabulary of a language— i.e., the non-Roots— consists of two types of heads. There are cyclic heads, the category-defining ones in (26), and, in addition, non-cyclic functional heads. In the latter category fall all other functional morphemes: Tense nodes, number nodes, and so on.

The hypothesized generalizations for sound/meaning connections that are expected on this type of theory are as follows, in the formulation of Embick and Marantz 2008:

(27) Cyclic Generalizations

- a. **Allomorphy:** For Root-attached x , there may be special allomorphy, determined by properties of the Root. A head x in the Outer domain is not in a local relationship with the Root, and thus cannot have its allomorphy determined by the Root.

- b. **Interpretation:** The combination of Root-attached x and the Root might yield a special interpretation. The heads x attached in the Outer domain yield predictable interpretations.

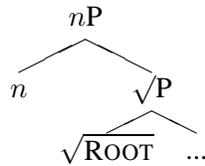
The notion of *Root-attached* invoked in (27) refers to the first category-defining head that appears in a structure.¹¹ The idea behind (27) is that being in the Root or *Inner* domain correlates with effects both in terms of interpretation and in terms of form; i.e., that structures in which a category-defining head x is merged with a Root are (potentially) special, in the senses covered by (27). A further motivation behind (27) is that the special domains should be defined as a consequence of the way that spell out works, not stipulated. The idea that, for example, *Outer* heads could not show Root-specific interactions would follow from the fact that in a cyclic theory based on (27), such heads are not present in the same cycle as the Root.

Patterns of nominal formation illustrate some of the basic properties of this type of cyclic theory. In some well-studied examples from early work on derivational morphology, it appears that patterns of allomorphy correlate closely with interpretive properties in a way that is congenial to the perspective of (27). The relevant data here center on the *derived* or *simple* nominals of (28a), versus the *gerundive nominals* (gerunds) found in examples like (28b) (this discussion draws on Chomsky 1970 and subsequent work):

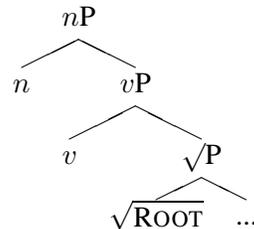
- (28) a. John's destruction of the city...
 b. John's destroying the city...

According to an analysis which, with different variants, has been given in the framework under discussion, the derived nominal involves root-attached n , as in (29), whereas the gerundive has n attached to a verbal constituent, shown as vP in (30), although there could in fact be motivation for additional non-cyclic structure between vP and n (see Marantz 1997, Alexiadou 2001 and related work). These structures are shown in (29) and (30):

(29) n Root-attached:



(30) n Not Root-attached:



In the structure (29), the n head shows a large number of allomorphs: *-al*, *-ity*, *-iage*, *-(t)ion*, \emptyset , and others. In the Outer domain schematized in (30), on the other hand, the phonological form of n is only *-ing*:¹²

(31) Nominals and Allomorphy

derived/simple	gerund
refus-al	refus-ing
marr-i-age	marry-ing
destru-ct-ion	destruy-ing
break- \emptyset	break-ing

Corresponding to this, the interpretations of the Root-attached cases are potentially idiosyncratic in ways that have been detailed amply in the literature, whereas the gerundive nominals do not have this property. The asymmetry in both interpretation and allomorphy seen in derived nominals versus gerunds constitutes the ideal state of affairs from the point of view of the kind of cyclic theory that is behind (27).

A provisional analysis of these effects can be framed in terms of the Inner/Outer domain distinction discussed above. In the Inner domain, where access to the Root is allowed, there is Root-determined allomorphy. In the Outer domain, on the other hand, there is only one VI that applies; this is shown in (32), where the LISTS contain the Roots that select the exponents in question:

- (32) a. Inner Domain
- | | | | |
|-----|-------------------|--------|----------|
| n | \leftrightarrow | -al/ | LIST1__ |
| n | \leftrightarrow | -age/ | LIST2__ |
| n | \leftrightarrow | -tion/ | LIST3__ |
| | | | \vdots |
- b. Outer Domain
- | | | |
|-----|-------------------|------|
| n | \leftrightarrow | -ing |
|-----|-------------------|------|

The intuition behind (32) is that in the Inner domain, the Root is in a “visible” relationship with the functional head n . By hypothesis, this relationship is the one defined by being in the same initial cycle as n , i.e., where n is head that categorizes the Root. I put aside more discussion of how patterns like the one in (32) could be accounted for formally until additional sets of data have been considered.

2.2.2 A \mathbb{C}_0 Theory

The theory based on (27) holds that it is only in the Inner domain that Root-specific allomorphy can be found. I refer to this as the \mathbb{C}_0 theory, since allomorphic relations are restricted to the cyclically closest (Root-attached) environment:¹³

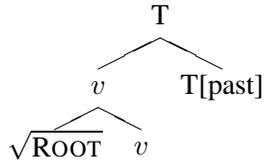
- (33) \mathbb{C}_0 Theory: Head x can be allomorphically sensitive to a head Y only if x and Y are in the same cyclic domain (typical case: x is attached to a Root Y)

An important empirical discovery is that the \mathbb{C}_0 theory is too restrictive. There are well-known cases of allomorphy that could not be derived if this theory were correct (cf. Embick 2003,2004a on English participial formations, Embick and Marantz (2008) on past tense). Consider, for example, the English past tense, which was used above to illustrate the mechanics of Vocabulary Insertion. The first two VIs in (34) contain exponents that are inserted in the context of certain Roots:

- (34) Vocabulary Items for Tense
- | | | | |
|---------|-------------------|--------------------|---|
| T[past] | \leftrightarrow | -t/___ | { $\sqrt{\text{LEAVE}}$, $\sqrt{\text{BEND}}$, ...} |
| T[past] | \leftrightarrow | - \emptyset /___ | { $\sqrt{\text{HIT}}$, $\sqrt{\text{SING}}$ } |
| T[past] | \leftrightarrow | -d | |

The structures in which T[past] is spelled out have a v and the T[past] node:

(35) Past Tense Verb



The \mathbb{C}_0 theory holds that T[past] cannot be sensitive to the Root, because T[past] is not in the Inner cycle. According to this theory, there should be no Root-specific allomorphy at T[past]; this is clearly incorrect.

The T[past] node and the Root interact in another way that suggests a similar conclusion. This interaction does not involve suppletive allomorphy, but instead involves the stem allomorphy found in certain irregular verbs. Specifically, the node T[past] triggers *Readjustment Rules* on certain Roots, and not others. For example, the Root $\sqrt{\text{SING}}$ undergoes such a rule to yield *sang*; the Root $\sqrt{\text{BREAK}}$ undergoes another such rule to yield *broke*; and so on. This means again that the Root must be visible qua Root when T[past] is processed at PF, something that the strict \mathbb{C}_0 theory rules out.¹⁴

In sum, the \mathbb{C}_0 theory is too strict, and an alternative must be developed. The following sections are devoted to this.

2.2.3 Generalizations about Allomorphic Locality

With a few exceptions, there is very little work describing the limits of allomorphic interaction. What this means for the purposes of developing a theory of allomorphy is that there is no clear consensus in the literature about what kinds of locality conditions regulate allomorphic closeness. Seminal works like Carstairs 1987 discuss this question, but overall a clear descriptive statement of what kinds of patterns are found (and what kinds are not) has not been forthcoming.¹⁵

Based on what has been described in the literature, and what is to be described below as well, it appears that the following generalizations hold:

- (G1) Root attached cyclic x can see the Root. This is clear from many of the examples above, and is, in a sense, unsurprising. For example, the wide range of nominalizing (n) exponents in English are found when n is Root-attached. This was illustrated above in 2.2.1.
- (G2) A non-cyclic (i.e. non-category-defining) head X can see a Root in spite of intervening cyclic x , but this seems to happen only when x is non-overt. This is the situation in the English past tense, where the phonologically null v head does not prevent the T[past] head from having its allomorphy conditioned by the Root.
- (G3) When there are two cyclic heads x and y in structures $[[\sqrt{\text{ROOT}} x] y]$, it seems that y cannot see the Root, even if x is not overt. That is, Outer or “category-changing” cyclic heads do not seem to be sensitive to the Root.

Although (G1-3) speak of functional heads seeing Roots, this is a simplification. The generalizations here apply as well to other heads that could be inside a cyclic domain defined by x . So, for example, (G2) should be read as saying that X can see W in $...W] y] X]$, as long as cyclic y is not overt; it does not matter whether W is a Root or a non-cyclic functional head. The same extension applies to (G3); y cannot see the Root or any functional heads that are in the complement of x .

There are many cases in which a functional head shows allomorphic sensitivity to another functional head. One is found with the adjectival *a* head that has the exponent *-able*, which *potentiates* (makes fully productive) the *-ity* exponent of *n*. Any *-able* affixed word in English, such as *break-able* from *break*, can be nominalized with an *n* that is pronounced *-ity* like *break-abil-ity*.¹⁶ The VI with *-ity* as exponent is specified for a set of Roots including $\sqrt{\text{CURI0US}}$ and $\sqrt{\text{ATROC}}$, which have nominal forms *curios-ity* and *atroc-ity*; along with these and other *-ity*-taking Roots, the *a* head that takes the *-able* also appears on this list:¹⁷

$$(36) \quad n \leftrightarrow \text{-ity/X}___ \\ \text{X} = \text{Roots } (\sqrt{\text{ATROC}}, \sqrt{\text{CURI0US}}\dots); [a, \text{-able}]$$

In structures with this *n* attached outside of the *a* with *-able*, VI inserts the *-ity* exponent at *n* (the structure here ignores material that might appear between the Root and the *a* head):

$$(37) \quad \text{a. Structure: } [[\sqrt{\text{ROOT}} a] n] \\ \text{b. VI: } [[\sqrt{\text{ROOT}} [a, \text{-able}]] [n, \text{-ity}]]$$

In this type of case, a functional head (in this example, *n*) has its allomorphy determined by an adjacent functional head (in this example, *a*).

2.3 Implementation of the Localist Theory

Above it was shown that the \mathbb{C}_0 theory is too restrictive: it rules out allomorphic interactions that are attested, such as Root-sensitive allomorphy of T[past] in English. At the same time, it appears that cyclic structure is still relevant for allomorphy, in the form of the generalization (G3). That is, to the extent that there are no cases of Root-sensitive allomorphy for cyclic *y* in structures like $[[\sqrt{\text{ROOT}} x] y]$, cyclic structure plays an important role in constraining which nodes can interact with each other.

The theory of allomorphy presented in this section is “hybrid” in the sense that it employs both linear and cyclic notions of locality. Representationally, the theory is highly restricted: it hypothesizes that contextually allomorphy is restricted to a node that sees another node by virtue of being concatenated with it:

(H1) Contextual allomorphy is possible only with elements that are concatenated by \frown

This aspect of the theory is somewhat restrained in comparison with e.g. early formulations of contextual visibility, such as Halle and Marantz 1993, where the structural notion of *Government* is mentioned as a factor in allomorphic locality. At the same time, it is less restrictive than the \mathbb{C}_0 theory, in that it allows allomorphic interaction across a cyclic domain boundary, as long as the interacting elements are concatenated (and, as long as intervening elements have zero phonetic exponents; see below). The linear aspect of theory allows for “mismatches” between linear and hierarchical structure (i.e., different “bracketings”); in principle, linear relations like concatenation can ignore any number of intervening syntactic brackets.

The idea that linear relations are important for allomorphy has been advanced in the literature. A proposal along the lines of (H1) is also advanced in Adger, Béjar, and Harbour 2001, which proposes a theory of allomorphy in which (with some additional conditions relating to syntactic

AGREE) linear adjacency plays a defining role. See also the discussion of Bobaljik 1999,2000 and related work, and the analysis of participial allomorphy in Embick (2003), which requires linear relations as well.

Beyond the restrictions imposed by (H1), the theory of cyclic domains constrains allomorphic interactions as well, by placing precise restrictions on which elements could conceivably interact in a given PF cycle. To a first approximation, some “outer” material cannot play a role in certain derivations, because it is not present when the PF of inner material is computed. Similarly, some “inner” material is not present when the outer morphemes undergo Vocabulary Insertion, because this inner material is derivationally closed off. These cyclic hypotheses are summarized in (H2):

- (H2) Cyclic spell out domains define which nodes are present in a given cycle of PF computation, and thus potentially “active” (capable of being referred to) for the purposes of contextual allomorphy. Some outer nodes are not present when inner nodes are sent to PF. In addition, superficially adjacent nodes sometimes cannot influence each other allomorphically because in terms of cyclic spell out, they are not active in the same PF cycle.

Together, the hypotheses (H1) and (H2) are formalized and elaborated in the rest of this chapter. Before the details of (H1) and (H2) are examined, it should be stressed that these hypotheses are independent of one another. That is, it does not follow from anything that both should be relevant to allomorphy; nor does the falsity of one entail the falsity of the other. It is a hypothesis of this work that (H1) and (H2) work together to restrict possible patterns of allomorphy in natural language.

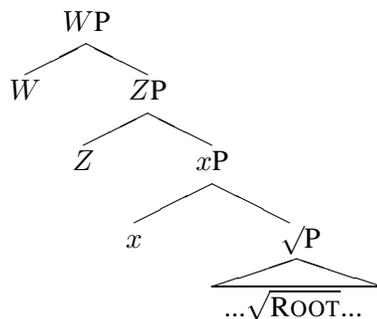
2.3.1 Cyclic Spell Out: The C_1 -LIN Theory

The theory centered on (H1) and (H2) is implemented in terms of a set of assumptions about syntactic derivations, and how they are spelled out. Following some assumptions reviewed above, I take the category-defining heads n, v , etc. to be *cyclic*:

- (38) Category-defining heads n, v etc. are *cyclic* heads: such heads define the *phases* that trigger spell out.

The crucial theoretical question is how phase-based spell out functions. Some additional notions that advance towards this point are illustrated in (39), where x is a cyclic head, and W, Z are non-cyclic; other material (e.g. specifiers, or material adjoined to any of these projections) is omitted for ease of exposition:

- (39) Sample structure



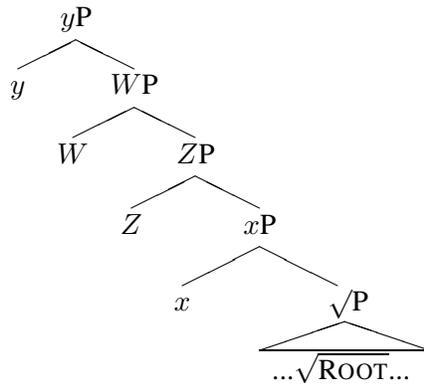
The head x is a phase head. The *complement* (or *domain*) of this head is the material in the \sqrt{P} . The phase head x is an *edge* element in the phase xP ; material adjoined to xP – or specifiers of xP – is also defined as edge material (cf. Chomsky 2001). The non-cyclic heads W and Z , which are merged higher than xP , do not have a special status in standard definitions of the phase. It appears that these heads are treated phonologically in the same cycle as the phase-head x . For this reason, I refer to “interphasal” elements like W and Z under the cover term *edge*⁺.

Cyclic heads define phases, and trigger the spell out of material to the interfaces. The assumption (SO1) specifies the manner in which such heads trigger spell out:

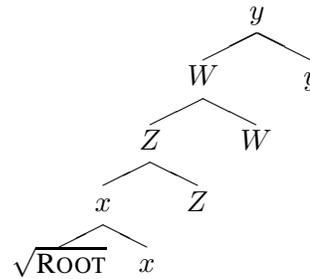
(SO1) When cyclic head x is merged, cyclic domains in the complement of x are spelled out.

For concreteness, take (40), which extends (39); as before, x and y are cyclic, whereas W and Z are not. (41) shows the complex head created in (40):

(40) Sample structure



(41) Complex Head



Although presented as a whole, these structures are built in a sequential derivation. First, the syntax derives the \sqrt{P} , and merges x with this. Since x is a cyclic node, spell out is triggered. This means that cyclic domains in the complement of x are spelled out; in (40), the result is that any cyclic domains in the \sqrt{P} are subject to VI and phonological processing.

Subsequent syntactic derivation merges non-cyclic W and Z to the xP ; to this object, cyclic y is then merged, and spell out is triggered at this point because y is cyclic. By (SO1), merging cyclic y triggers spell out of cyclic domains in y 's complement. A further assumption is required to specify what material is spelled out in this way. The general principle at play in defining which material is spelled out is (SO2):

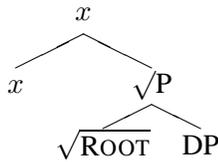
(SO2) Merge of cyclic y triggers spell out of cyclic domains in the complement of y , by (SO1). For a cyclic domain headed by cyclic x in the complement of y , this means that the complement of x , the head x itself, and any *edge*⁺ material attached to x 's domain undergoes VI.

While (SO1) specifies which nodes trigger spell out, (SO2) specifies what piece of structure is operated on. With reference to (40), the cyclic domain headed by x is sent to PF when y is merged. This cycle of computation operates on the Root, the head x , and the *edge*⁺ heads W and Z . In this PF cycle, the head x undergoes VI, as do W and Z . Roots are not (by hypothesis) subject to VI, but

in this cycle, the Root undergoes phonological processing (the exponents inserted at the functional nodes might be processed phonologically as well).

The main idea behind (SO2) is that material in the complement of a phase head is spelled out. There are some other conceivable formulations that achieve this effect. For example, one possibility—(SO2′)—would be to hold that when a phase head y is merged, the complement of y is spelled out, as long as there is a phase-defining head x in the complement of y . This (SO2′) does much of what (SO2) does, by spelling material in the complement of the phase head, but there are some important differences as well. In particular, consider (42), where the phase head x takes a complement consisting of a Root with a DP complement:

(42) Root with DP complement



If DP is a phase (cyclic domain), then (SO2) and (SO2′) differ with respect to how this object is processed. By (SO2), the $\sqrt{\text{ROOT}}$ is not spelled out until a higher cycle when another cyclic head y is merged. By (SO2′), on the other hand, the presence of a phase (i.e., the DP) in the complement of x would cause the complement of x to be spelled out at the stage shown in (42). This might make it impossible for the Root to affect allomorphy of nodes outside of x , as is required in the case of the English past tense; see below. There are other formulations of (SO2) (or (SO2′)) that could address this point (e.g., (SO2′) could be modified so that y ’s complement is spelled out when it contains a phase in some particular configuration with respect to y). As long as these formulations spell out the complement of the phase head under conditions like those found in (SO2/SO2′), they are appropriate for the purposes at hand, although of course such alternatives might produce a number of distinct predictions in other domains.

As far as allomorphy is concerned, the essential empirical questions addressed by (SO2) concern when the heads that occur between phase heads like y and x are spelled out; these are heads like W and Z in (40-41). A consequence of (SO1) and (SO2) is that non-cyclic heads like W and Z that are attached to a cyclic head x could show allomorphic sensitivity to x or elements like the Root in the complement of x , because all of these nodes are present and subjected to VI in the same cycle. The assumption that the edge+ material attached to phase-head x is spelled out in the same cycle as x is motivated empirically; it is an assumption that does not follow from other aspects of the system. In particular, spelling out edge+ material in a cycle in which the complement of the cyclic head is still active allows for e.g. the Root-determined allomorphy of e.g. English past tense nodes (a step-by-step presentation of the derivation of the past tense appears in 2.3.3).

What remains to be defined is the manner in which substructures that have been spelled out come to be “closed off” for later cycles of computation. The definition of (SO3) specifies this part of the theory:¹⁸

(SO3) Material in the complement of a phase head that has been spelled out is not active in subsequent PF cycles. That is, the complement of a cyclic head x is not present in the PF cycle in which the next higher cyclic head y is spelled out.

With reference to (40), the effects of (SO3) are as follows. When y is merged, the cyclic domain defined by x is spelled out. By (SO2), then, x , the complement of x , and edge^+ heads attached to x undergo VI. In a subsequent stage of the syntactic derivation, when some cyclic head above y is merged, the cyclic domain centered on y is spelled out. In this cycle, (SO2) specifies that y , its complement, and edge^+ are present. The head x and its edge^+ material— W and Z in the example above— are also present in this cycle of spell out. These heads are already instantiated phonologically, however, since they are subjected to VI in the cycle triggered by merge of y . No other material is present when y is spelled out; in particular, (SO3) says that material in the complement of x is not present in this cycle.

The effect of (SO3) is to remove certain nodes from the computation past a certain cyclic boundary. The way that (SO3) is defined, an Outer cyclic head has its phonological form computed in a cycle in which the complement of an Inner cyclic head is not present. This aspect of the theory accounts for (G3) above, i.e., the absence of Root-specific allomorphy for Outer cyclic heads, and its effects are seen in other domains as well.

Taken together, the effects of (SO1-SO3) are shown schematically in (43), where the subscript on the brackets indicates the node that triggers spell out, and the nodes contained within the bracket are the nodes present in that PF cycle. Because there are no cyclic domains in the complement of x in the hypothetical structure that is being considered, (43) begins with the cycle triggered by y , in which the bracketed material in (43a) is present. In the cycle determined by z , the bracketed material in (43b) is present:

$$(43) \quad \text{a. } \underbrace{\left[\left[\left[\left[\sqrt{\text{ROOT}} \ x \right] \ W \right] \ Z \right] \ y \right]}_y$$

Cyclic y triggers spell out of cyclic domains in its complement. The head x undergoes VI, as do the edge^+ heads W and Z . The Root is processed phonologically.

$$\text{b. } \left[\left[\left[\left[\sqrt{\text{ROOT}} \ x^* \right] \ W^* \right] \ Z^* \right] \ y \right] \dots z \underbrace{\hspace{10em}}_z$$

*Merge of higher cyclic z triggers spell out of cyclic domains in its complement. The head y defines a cyclic domain, and is subjected to VI (along with any edge^+ heads it might have). The heads marked with *— x , W , Z — are present when y undergoes VI, but have undergone VI in the earlier cycle.*

From (SO1-3), two important corollaries follow. It is convenient to refer to these by name, since they are central to explaining the empirical generalizations (G1-G3), along lines that are outlined above.

The first corollary, which follows from (SO1), is that a cyclic head is not present in the cycle of spell out that it induces; this is the DOMAIN COROLLARY:

- (44) DOMAIN COROLLARY: Cyclic head x is not present in the PF cycle of computation that is triggered by merge of x . Thus, x is *not* subjected to Vocabulary Insertion (and thus cannot undergo any phonological processing) until the next cycle of spell out, when it is in the *domain* of another cyclic head.

A second corollary that is derived from (SO2) and (SO3) concerns which nodes are present in a cycle of PF computation. These nodes could potentially interact for allomorphic or other purposes.

Another way of stating this is that the nodes that are co-present in a given cycle are potentially *active* with respect to one another. The most important work done by this aspect of the theory is in structures with more than one cyclic head. The ACTIVITY COROLLARY is tailored to this type of case:¹⁹

- (45) ACTIVITY COROLLARY: In $[[\dots x] y]$, x, y both cyclic, material in the complement of x is not *active* in the PF cycle in which y is spelled out.

It is useful to refer to the DOMAIN COROLLARY and the ACTIVITY COROLLARY in discussing how particular empirical results are derived. It must be emphasized, however, that these are not separate hypotheses beyond (SO1-3); as their names imply, they are corollaries of that general set of assumptions about how cyclic spell out works.

I refer to the theory based on (SO1-3) as a \mathbb{C}_1 cyclic theory. Unlike the \mathbb{C}_0 theory discussed above, it allows allomorphic interaction beyond the Root-attached domain. At the same time, while allomorphic visibility is possible when *one* cyclic head is present, elements in the domain of a cyclic head are inactive in the cycle in which an outer cyclic head is spelled out.

The linear condition of (H1) operates in addition to the \mathbb{C}_1 cyclic theory of (H2). I call their combination the \mathbb{C}_1 -LIN theory.

2.3.2 Application to Cyclic Heads

The \mathbb{C}_1 -LIN theory can be illustrated with some initial examples, centering on the key contrast between the behavior of Inner versus Outer cyclic heads; (G1) and (G3) above. The important comparisons that were used for exposition in 2.2.1 center on derived/simple nominals versus gerunds.

Beginning with the former, a simple noun like *marriage* has the structure in (46); here and below, I employ structures that are complex heads:

- (46) Merge of n



The cyclic n morpheme triggers spell out, such that any phases in the complement of n are spelled out at this stage. In the example (46), there are no phases in n 's complement. During the next cycle of spell out, triggered by a higher cyclic head, the cyclic domain centered on n in (46) is spelled out. In this cycle, the Root $\sqrt{\text{MARRY}}$ and the n are linearized, and the VI with *-age* as exponent to n . The steps in the derivation of *marriage* are summarized in (47):

- (47) Syntax: Higher cyclic head triggers spell out of n
- a. PF: Linearization $\sqrt{\text{MARRY}} \frown n$
 - b. PF: VI at n : $\sqrt{\text{MARRY}} \frown [n, \text{-age}]$

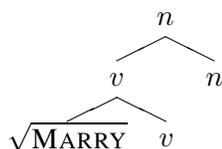
The derivation of the “category-changing” de-verbal nominal *marry-ing*, in which n is attached outside of v , involves some additional steps. To begin with, the Root and v are merged:

- (48) Merge of v



The v head triggers spell out in the way described above. A subsequent stage of the syntactic derivation merges n to (48):²⁰

(49) Merge of n over v :



The n head triggers spell out of material in its domain. In the PF cycle defined by n , the v head undergoes VI, which inserts $-\emptyset$. In a subsequent cycle, the n head is subject to VI, which inserts the *-ing* exponent. These steps are summarized in (50), which begins with the merge of n :

- (50) a. Merge of n triggers spell out of v -phase
- i. PF: Linearization $\sqrt{\text{MARRY}} \frown v$
 - ii. PF: Vocabulary Insertion at v : $\sqrt{\text{MARRY}} \frown [v, -\emptyset]$
- b. Syntax: Later cycle triggers spell out of n -phase
- i. PF: Linearization $[v, -\emptyset] \frown n$
 - ii. PF: Vocabulary Insertion at n : $[v, -\emptyset] \frown [n, -ing]$

In the derivation of *marry-ing*, the n head cannot see the Root for contextual allomorphy, even though the n and the Root $\sqrt{\text{MARRY}}$ are superficially adjacent (i.e., there are no overt morphemes intervening between them). As shown in (50b-ii), when n is subjected to VI, the Root is not present in that cycle. Thus, n could never show allomorphy conditioned by the Root in this type of formation. The insensitivity of Outer cyclic nodes to elements in the complement of an Inner cyclic nodes is a manifestation of the ACTIVITY COROLLARY.

2.3.3 Transparency and Pruning

While Outer cyclic nodes cannot see across Inner cyclic nodes, non-cyclic nodes outside of a cyclic head are able to see into the Inner domain; recall that, as stated in (G2), in structures like (51), non-cyclic Z can show Root-specific allomorphy across cyclic x :

$$(51) \quad \dots \sqrt{\text{ROOT}}] x] Z]$$

This is the kind of structure found in the English past tense, where x is v , and Z is the tense node T[past]. The latter head can show Root-determined allomorphy.

The importance of this type of example for cyclic structure was stressed above, where it was shown that cases like (51) require something more than the \mathbb{C}_0 theory of cyclicity. Another important point about (51) can be seen with reference to (H1), the concatenation requirement on contextual allomorphy. The linearization procedure employed above derives the linearization statements in (52) from (51):

$$(52) \quad \sqrt{\text{ROOT}} \frown x, x \frown Z$$

In these statements, Z is not concatenated with the Root, yet it potentially shows Root-determined allomorphy. The hypothesis (H1) that contextual allomorphy is restricted to concatenated elements narrows the range of options for treating the type of case in (51). If this hypothesis is correct, it must be the case that the Root and Z are concatenated when VI occurs at Z .

This type of question is addressed in Embick 2003, which proposes that some nodes with null ($-\emptyset$) exponents are transparent for certain linear relations. This can be made precise by positing a type of *Pruning* rule that eliminate nodes from concatenation statements. As a working hypothesis, I assume that this kind of rule has the properties specified in (53):

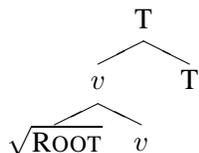
(53) PRUNING SCHEMA:

$$\sqrt{\text{ROOT}} \frown [x, -\emptyset], [x, -\emptyset] \frown Y \longrightarrow \sqrt{\text{ROOT}} \frown Y$$

The rule eliminates pieces with null exponents. Pruning rules are, evidently, not obligatory for all nodes with zero exponents. There are some cases in which it appears that a head with a null exponent is present in concatenation statements.²¹ The question of whether or not there are significant generalizations about which zeroes are Pruned and which are not remains to be investigated. In the discussion below, I will posit Pruning rules where required.

The effects of Pruning can be illustrated with reference to the English past tense. Past tense verbs have the structure in (54). The v node intervenes between the Root and T[past], as shown in (55a). Pruning eliminates the $[v, -\emptyset]$ node from the concatenation statements, as shown in (55b). When VI at T[past] takes place, the concatenation statements in (55b) is present:

(54) Structure



$$(55) \quad \begin{array}{l} \text{a. } \sqrt{\text{ROOT}} \frown v, v \frown \text{T[past]} \\ \text{b. } \sqrt{\text{ROOT}} \frown \text{T[past]} \end{array}$$

The steps in the derivation of a past tense form are shown in (56):

- (56) a. Syntax: v and the Root are merged
- i. PF: Spell out of phases in the domain of v
 - b. Syntax: T head merged with v P
 - c. Syntax: Higher cyclic head triggers spell out of v -headed phase
 - i. (T lowers to v to create complex head $[[\sqrt{\text{ROOT}} v] \text{T[past]]]$)
 - ii. Linearization: $\sqrt{\text{ROOT}} \frown v, v \frown \text{T[past]}$
 - iii. VI at v : $\sqrt{\text{ROOT}} \frown [v, -\emptyset], [v, -\emptyset] \frown \text{T[past]}$
 - iv. Pruning: $\sqrt{\text{ROOT}} \frown [v, -\emptyset], [v, -\emptyset] \frown \text{T[past]} \longrightarrow \sqrt{\text{ROOT}} \frown \text{T[past]}$
 - v. VI at T[past]

In the last step, VI at T[past] takes place when T[past] is concatenated with the Root, making Root-determined allomorphy possible.

2.3.4 Synopsis

The generalizations (G1-3) above were framed against the predictions of the \mathbb{C}_0 theory of allomorphy, which holds that contextual allomorphy is possible only for morphemes in Inner cyclic domains. The fact that Outer, non-cyclic morphemes do in fact show Root-determined allomorphy, as seen in the English past tense, and summarized in (G2), shows that the \mathbb{C}_0 theory is too restrictive. The empirical contrast that must be accounted for is that between Outer non-cyclic nodes covered by (G2), and Outer cyclic nodes. By (G3), the latter do not see elements in the complement of an Inner cyclic head.

The defining hypotheses presented advanced above are (H1) that contextual allomorphy is restricted to the relation of concatenation, and (H2) that a node must be *active* in the cyclic sense in order to be visible to another node. How insertion interacts with cyclic spell out is defined by the assumptions (SO1-3). Finally, the concatenation-based theory requires the further assumption that Pruning takes place with some nodes that have zero exponents. As a whole, this approach is referred to as the \mathbb{C}_1 -LIN theory, and it accounts for (G1-3) in the manner outlined above.

2.4 Vocabulary Items

While cyclic structure plays a crucial role in the \mathbb{C}_1 -LIN theory, the theory also makes claims about the forms that a Vocabulary Item can take. This section outlines some further aspects of this component of the theory.

2.4.1 Specification

According to (H1), the type of information that may appear in the contextual conditions of a VI is restricted to the relation of concatenation. Schematically, then, this means that the theory allows VIs of the types shown in (57):

- (57) a. $[X] \leftrightarrow /y/ / [Y] \frown _$
 b. $[X] \leftrightarrow /y/ / _ \frown [Y]$

To this point, I have employed binary concatenation statements. One additional question concerning the specification of VIs is whether there are cases in which a node shows contextual allomorphy that is determined by elements both to the right and to the left of it; i.e., (58), which could be seen as abbreviating two binary statements (or, alternatively, with another definition of \frown):

- (58) $[X] \leftrightarrow /y/ / [Y] \frown _ \frown [Z]$

One potential example of this type is found in the first person singular subject agreement morpheme in the Athabascan language Hupa (Golla 1970:69ff.). This prefix typically appears as *W-*, as in (59a). However, when this morpheme is preceded by a perfective prefix, it surfaces as *e-*. This contextual allomorphy of 1s is found only with active (i.e. eventive) verbs (59b). In statives, the default *W-* allomorph appears (59c):

- (59) a. no:xoWtiW
 no- x^wi- W- ɬ- tiW
 ADV OBJ 1s.SUBJ TRANS put
 ‘I put him down’

- b. na:se:ya?
na- si- e- ya?
ADV PERF 1s go
‘I have gone about’
- c. siWda
si- W- da
PERF 1s sit
‘I am sitting.’

On the assumption that eventivity or stativity is encoded in *v*, the distribution of the *e*- allomorph of 1s requires reference to a preceding perfective morpheme and a following eventive *v*:

- (60) [1s] ↔ e-/[perf] ^ __ ^ v[eventive]
[1s] ↔ W-

Rules with conditioning factors to the left and the right of the element undergoing the change are seen elsewhere in PF; certain phonological rules have this property, for example. If examples like the Hupa one are revealed to be possible in more detailed investigations, then some formal modifications might be required for the operator that defines locality relevant for allomorphy. Alternatively, it could simply be the case that conjoined concatenation statements are visible for the purposes of VI.

Another question to consider is what kinds of information can appear in the contextual conditions for a single VI. In particular, it can be asked whether a single VI could be specified so that it is inserted to the left of certain objects, but to the right of other objects, as shown in (61):

- (61) [X] ↔ /x/ / [Y] ^ __, __ ^ [Z]

This hypothetical VI is employed to the right of Y elements, and to the left of Z elements. As far as it can be determined at this point, this type of representation is consistent with the restrictions on VI hypothesized here, although I am not aware of any clear cases of this type.

2.4.2 Outwards Sensitivity

Many of the examples of allomorphy that appear above show what has been called *inwards sensitivity*: an outer morpheme has its allomorphy determined by the properties of a morpheme that is structurally inside of it.²² Morphemes may also show *outwards sensitive* contextual allomorphy, in which the properties of a structural outer morpheme determine allomorph selection at an inner node.

As an illustration of this effect, consider the case of Hungarian “outwards sensitivity” of plural; the plural morpheme surfaces as *-(V)k* in unpossessed forms, but as *-((j)a)i-* when there is a following possessive morpheme:

- (62) Hungarian Plural/Possessive (Carstairs 1987:165)

Singular	Singular-1s Poss.	Plural	Plural-1s Poss.	Gloss
ruha	ruhá-m	ruhá-k	ruha-ái-m	‘dress’
kalap	kalap-om	kalap-ok	kalap-jai-m	‘hat’
ház	ház-am	ház-ak	ház-ai-m	‘house’

It is assumed that these nouns have the structure in (63):

(63) Structure: [[[_n √ROOT _n] pl] poss]

In the PF cycle in which the phonological forms of [pl] and [poss] are determined, the linearization procedure derives statements that concatenate these nodes prior to VI. If the Vocabulary of Hungarian contains the following VIs, the correct results are derived (ignoring the conditions on the parenthesized components):

(64) [pl] ↔ -(j)a_i-/_[^][poss]
 [pl] ↔ -(V)k-

Different discussions of allomorphy have had different things to say about potential asymmetries between these types of sensitivities, beginning with the discussion of Carstairs (1987). Within the context of the “inside out” type of Vocabulary Insertion that has been assumed in Distributed Morphology and some theories that precede it, some predicted asymmetries are clear. For example, an “inner” morpheme cannot have its allomorphy determined by *phonological* properties of an outer morpheme in such a theory, since, by hypothesis, this outer morpheme would not yet have undergone Vocabulary Insertion (see Bobaljik 2000 for additional discussion). Carstairs-McCarthy (2001,2003) discusses some other possible differences.²³

Cyclic derivation places some further constraints on when outwards sensitivity can occur. These predictions are outlined in 2.6. The limited outwards sensitivity allowed in the \mathbb{C}_1 -LIN theory is particularly important in the light of Globalist alternatives, which are examined in Chapter 6.

2.5 Potential “Long Distance” Effects

If the theory presented above is correct, contextual allomorphy is highly restricted in scope. Apparent cases of allomorphy that do not take place under linear adjacency in a cyclic domain must result from other phenomena. At least two different types of effects that can result in *prima facie* less local interactions must be considered.²⁴

2.5.1 Contextual Allomorphy versus Impoverishment

The linear component of the \mathbb{C}_1 -LIN theory is centered on concatenation. The concatenation operator plays a role in other domains as well; for example, it seems that many cases of postsyntactic affixation (“affixation under adjacency”) can be treated in these terms (see Embick 2007b, following much earlier literature cited there). Other operations during the PF derivation are defined in terms of other relations of locality. In particular, it appears that *Impoverishment* rules must be defined over larger structures, in terms of non-linear conditions of locality.

An Impoverishment rule is a rule that deletes the features on a node in a particular context. The result of this deletion in a theory in which competition for insertion is determined by specificity is clear: a less specified (or default) VI applies to the impoverished node. This type of effect has been discussed extensively since early work in the Distributed Morphology framework (cf. Bonet 1991 and Noyer 1992). A familiar example of this is with the so-called “spurious *se*” rule in Spanish: instead of the expected *le* Dative clitic, the “default” clitic *se* is inserted in the context of an Accusative clitic. This effect can be analyzed in terms of two steps: first, the features otherwise responsible for the insertion of *l(e)* are deleted in the relevant context; and, second, the language contains *s(e)* as a default for the clitic node (see the works cited above and Halle and Marantz (1994) for some discussion and illustration).

In a sense, the effects of Impoverishment could look like allomorphy. Impoverishment rules are employed when an “expected” exponent does not surface in a particular context, and another exponent is found instead. Consider the Spanish example immediately above. Rather than the otherwise expected *l(e)* allomorph, the *s(e)* allomorph appears in a particular context. At this level of description, this is similar to contextual allomorphy, where an expected exponent fails to occur as well. Beyond this, however, the similarities end. In Impoverishment, the point is that a less specified VI that already exists in the system is employed in a context in which a more specific VI is expected. In contextual allomorphy, the situation is reversed: a VI with contextual conditions on insertion is posited to block the insertion of the expected or default VI for a certain environment. Since contextual allomorphy and Impoverishment differ in terms of whether a more specified or less specified VI applies, it is to be expected that, in the normal case, it will be clear whether one is dealing with the contextual effects of Impoverishment, or the contextual effects associated with allomorphy (special VIs).

In addition to these differences in terms of feature specification, it appears that there are locality differences between Impoverishment and contextual allomorphy as well. Investigation of Impoverishment rules in Halle and Marantz 1993 and subsequent work involves application of these rules in cases that involve non-adjacent morphemes. One working hypothesis, which relates directly to the main point of this section, is that Impoverishment could give the effect of action at a distance for insertion by operating on nodes that occur within a cyclic domain (phase), whether or not these nodes are concatenated; this position has been discussed by Marantz in unpublished work, with examples from Nimboran (see Inkelas 1993, Noyer 1995) and some other languages.

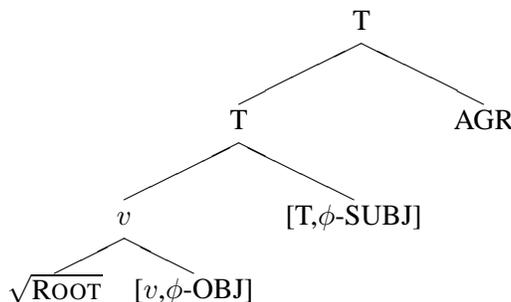
It is possible, then, that certain prima facie counterexamples to the adjacency-based theory of allomorphy do not in fact involve contextual allomorphy, but instead are cases of Impoverishment.

2.5.2 Syntax: Features from AGREE

An additional source of superficially long-distance interactions derives from certain assumptions about syntactic relations. Specifically, if it is assumed that the operation of AGREE (Chomsky 2000) applies between elements like *v* and T and other phrases in the clause (i.e., DPs), then the features of these phrases might be visible in a complex head in positions that are not necessarily where agreement morphemes (i.e. “AGR nodes”) are found.

More concretely, it is standardly assumed that the head *v* in a transitive *v*P enters the relation of AGREE with the object, while T enters into this relation with the external argument. In a typical “verb” for a hypothetical language, then, the complex head that is spelled out as the verb might, all other things being equal, have features of the object and the subject in *v* and T respectively (the structure in (65) shows an AGR node adjoined to T for expository purposes as well):

(65) Verb: Features from AGREE



Without the ϕ -features from AGREE on v and T as in (65), the predictions about allomorphy in a verb with the structure $\sqrt{\text{ROOT}}-v\text{-T-AGR}$ are clear. The v head, for example, could not be affected by the person number features of the subject associated with AGR.

On the other hand, if the features are placed (or valued) by AGREE in the manner shown in (65), then some additional interactions are possible; this point is discussed in Adger et al. 2001, where it is proposed that at least some long distance effects are the result of AGREE (cf. also Bobaljik and Wurmbrand 2002). Importantly, these interactions are of a type that appear problematic for an adjacency-based theory, as discussed in detail by Bobaljik (2000).

More precisely, it would be possible for the v head to see features of the subject, by hypothesis valued on T; similarly, the T head might see the features of the object on v . This is clearly less restrictive than the theory without features distributed by AGREE in this manner, and it must be determined empirically whether this range of interactions is found (see Chapter 3 for some additional discussion).

2.6 Core Predictions of the \mathbb{C}_1 -LIN Theory

Many of the key predictions of the \mathbb{C}_1 -LIN theory were outlined in section 2.3. In a slightly expanded form which takes into consideration some additional subcases, these predictions are reiterated in this section. The predictions are organized according to first, inwards versus outwards sensitivity, and, within these categories, whether the node being spelled out is non-cyclic or cyclic.

Beginning with inwards sensitivity, the predictions for non-cyclic heads are as follows:

Non-Cyclic Heads

- (a) Non-Cyclic Y may show allomorphy determined by Root or non-cyclic head α in cyclic x 's complement in

... α] x] Y]

provided that α and Y are concatenated when VI occurs.

- (b) Non-cyclic Y may also have its allomorphy determined by x , or by another non-cyclic W between x and Y in

... x] Y], or

... x] W] Y]

provided that Y and the element conditioning its allomorphy are concatenated when VI occurs.

- (c) Non-Cyclic Y that is part of the edge+ of cyclic y cannot have its allomorphy determined by (cyclic or non-cyclic) α that is in the complement of inner cyclic x in

... α] x] ... y] Y]

under any circumstances.

For cyclic heads and inwards sensitivity, the \mathbb{C}_1 -LIN theory predicts the following:

Cyclic Heads

- (a) Cyclic x may show allomorphy determined by Root or non-cyclic α in its complement:

... α] ... x]

provided that α and x are concatenated when VI occurs.

- (b) Cyclic y may not have its allomorphy determined by α in the complement of Cyclic x in

... α] x] y]

under any circumstances.

- (c) Cyclic y may have its allomorphy determined by cyclic x , or by non-cyclic W in

...] x] W] y]

provided that that y and the conditioning element are concatenated when VI occurs.

Turning to outwards sensitivity, the predictions of the \mathbb{C}_1 -LIN theory are as follows, beginning with non-cyclic heads:

Non-Cyclic Heads

- (a) Non-cyclic Z that is part of the edge+ of cyclic x may have its allomorphy conditioned by non-cyclic W in

... x] Z] W]

provided that Z and W are concatenated when VI occurs.

- (b) Non-cyclic Z that is part of the edge+ of cyclic x may not have its allomorphy conditioned by outer cyclic y in

... x] Z] y]

under any circumstances.

The first prediction follows straightforwardly from the fact that non-cyclic heads like Z and W are spelled out in the same cycle. The second prediction follows from the assumption in (SO2) above that when a cyclic domain headed by x is spelled out, the edge+ material attached to x is spelled out as well. In this cycle, y is not present, and thus cannot condition the allomorphy of x 's edge+ heads.

For cyclic heads looking outwards, the predictions are as follows:

Cyclic Heads

- (a) Cyclic x may have its allomorphy determined by non-cyclic Z in its edge+ in

... x] Z]

provided that x and Z are concatenated when VI occurs.

(b) Cyclic x may not have its allomorphy determined by cyclic y in

... x] ... y]

under any circumstances.

The predictions outlined in this section are examined and illustrated in many further examples studied in Chapter 3. They are *core* predictions in the sense that they cover a number of the cases that appear to be empirically significant. Other predictions can be derived from the \mathbb{C}_1 -LIN theory, and some of these are identified as the discussion proceeds.

Applications and Implications

This chapter presents some case studies that are either motivations for or consequences of the \mathbb{C}_1 -LIN theory. The initial discussion concentrates on the predictions that this theory makes concerning (linear) *Intervention Effects* and certain kinds of *Domain Effects*. These derive from the linear and the cyclic parts of the theory respectively.

With respect to linear intervention, the theory predicts that if a node X is conditioned allomorphically by another node Y , a linearly intervening element W will cause X to default to an “unconditioned” alternant (or one conditioned by W), since Y is not visible to X . Some cases of this type are examined in 3.1.

The predictions concerning domains take different forms. In the \mathbb{C}_1 -LIN theory, cyclic heads trigger spell out of phases in their complement. This means that a cyclic head x and its attendant material undergo VI in the domain of another cyclic head, y , which is not itself spelled out in the cycle that it triggers. This aspect of the theory is shown to have implications in numerous domains in 3.2. First, it follows from this theory that two cyclic heads cannot undergo VI in the same cycle. This rules out *fusion* of derivational morphemes of a particular type, as shown in 3.2.1. Second, it is predicted that inner cyclic heads cannot see outer cyclic heads at the point where VI occurs. Some important case studies for this prediction are examined in 3.2.2. Finally, it is predicted while cyclic heads cannot see outer cyclic material, there could be allomorphy triggered by outer *non-cyclic* material for such nodes. This latter set of predictions is illustrated with reference to *stem suppletion* in 3.2.3.

A further set of questions is addressed in 3.3, which examines complex systems of affixation where the same type of functional head is found in both Inner (Root-attached) and Outer (outside of other cyclic head) domains. This type of distribution was also seen in Chapter 2, where it was shown that English nominals have a number of different Root-determined n allomorphs in the Root-attached domain, but take *-ing* across the board in gerunds. Further patterns of allomorphy in which the same type of head is attached in both Inner and Outer domains illustrate the cyclic aspect of the theory, and raise many additional questions about allomorphy as well. For example, while *-ing* appears as the exponent of Outer n in gerunds, there are also instances in which Root-attached n shows this allomorph. This raises the question of how such instances of identity across domains are represented in the Vocabulary.

A final set of questions, addressed in 3.4, centers on some of the ways in which the \mathbb{C}_1 -LIN theory interacts with the phonological component of the grammar, paving the way for the second part of this book. A preliminary part of this discussion shows what types of phonologically conditioned allomorphy are expected on the \mathbb{C}_1 -LIN theory. Further questions concerning (i) the locality constraints on *Readjustment Rules*, and (ii) how the phonology may “obscure” a local allomorphic relationship, are addressed as well.

3.1 Illustrations I: Visibility and Linear Intervention

If contextual allomorphy is restricted to concatenation, then it should be possible to detect *linear* intervention effects: cases in which a head shows a special allomorph or allomorphs when it is adjacent to some conditioning head, but shows another realization when another piece intervenes.

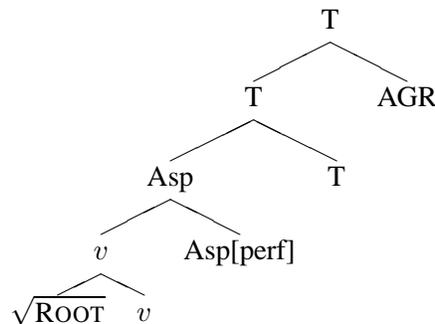
In the abstract, cases like this are important for two reasons. The first is that intervention of any sort promises to reveal much about locality, a point that is clear in many domains, both in syntax and in phonology. A second point concerns the specific types of relations that are implicated for locality. To the extent that the intervention effects in contextual allomorphy are linear (as opposed to hierarchical), and do not involve changes in cyclic structure, they provide evidence for a theory in which linear relations play a defining role.

3.1.1 Adjacent Heads in Latin Perfects

The Latin perfect indicative shows unique Agreement affixes for certain person/number combinations. These special agreement morphemes are not seen in any other part of the verbal system. Significantly, these endings are found only when the AGR morpheme is linearly adjacent to the Aspectual head associated with the perfect meaning.

The Latin Tense/Mood/Aspect system includes both imperfect and perfect forms, which may be further specified for Tense (present, past, future) and Mood (indicative, subjunctive). The examples that I analyze here are all part of the perfect system. I assume that these are based on the structure in (1), a complex head that contains the head Asp[perf] and a Tense head (see Embick 2000 for some discussion; I put aside Voice and Mood (subjunctive) in this structure for simplicity):

(1) Structure:



(2) Features of T:

- [pres] = Present Perf.
- [past] = Pluperfect
- [fut] = Future Perfect

The Tense features in (2) appear in the structure in (1) to create present perfects, pluperfects, and future perfects respectively.

The allomorphy of interest is found in the person/number endings, which realize AGR in (1). As noted above, the perfect indicative shows unique endings not seen elsewhere in the verbal system; these are seen in the leftmost column of (3), where the boldfaced agreement morphemes are different from those found in the other columns:

(3) Perfect forms of *amō* ‘love’

P/N	Perf. Ind.	Plup. Ind.	Perf. Subj.	Plup. Subj.	Fut. Perf
1S	amā-v-ī	amā-ve-ra-m	amā-ve-ri-m	amā-vi-s-se-m	amā-ve-r-ō
2S	amā-v-istī	amā-ve-rā-s	amā-ve-ri-s	amā-vi-s-sē-s	amā-ve-ri-s
3S	amā-vi-t	amā-ve-ra-t	amā-ve-ri-t	amā-vi-s-se-t	amā-ve-ri-t
1P	amā-vi-mus	amā-ve-rā-mus	amā-ve-ri-mus	amā-vi-s-sē-mus	amā-ve-ri-mus
2P	amā-v-istis	amā-ve-rā-tis	amā-ve-ri-tis	amā-vi-s-sē-tis	amā-ve-ri-tis
3P	amā-v-ērunt	amā-ve-ra-nt	amā-ve-ri-nt	amā-vi-s-se-nt	amā-ve-ri-nt

Some additional comments are in order concerning the forms in (3), with respect to the assumed segmentation and the operation of phonological rules.

The segmentation shown in (3) assumes that the Asp[perf] morpheme has the phonological exponent *-vi*. This *-vi* exponent is the default for this head, which also shows other Root-determined allomorphs. In particular, the perfects of other verbs show *-si* and *-i* allomorphs of Asp[perf], as shown in (4) (first plural forms are used for clarity):

- (4) Asp[perf] exponents
- a. *-si* in e.g. *scrip-si-mus* ‘we wrote’
 - b. *-i* in e.g. *vēn-i-mus* ‘we came’

Some important patterns that center on the allomorphy of the Asp[perf] head are discussed in Chapter 6.

Linearly following the Asp[perf] morpheme in many of the forms in (3) are morphemes associated with Tense, or Tense and Mood in the case of subjunctives. These morphemes intervene linearly between the Asp[perf] piece and the final morpheme of the word, which is the Agreement (AGR) morpheme. So, for example, the Pluperfect Indicative is broken down as follows:

- (5) am ā ve rā mus
love TH Asp[perf] TNS AGR
‘We had loved’

The appearance of Tense morphemes between Asp[perf] and AGR occurs in almost all of the Tenses shown in (3). In the Present Indicative, however, there is no Tense morpheme between Asp[perf] and AGR; see below.¹

The effects of a number of phonological rules can be seen throughout the forms in (3). Full discussion and justification of these rules can be found in Embick and Halle (in prep.); for present purposes, I will merely outline the relevant processes.

One rule whose effects are seen in many of the forms in (3) affects the vocalic component of *-vi*. Specifically, the /i/ component of Asp[perf] *-vi* is deleted when it precedes a vowel. This rule produces e.g. surface *amā-v-ī* from underlying *amā-vi-ī*.

In addition to this deletion rule, underlyingly long vowels are shortened in syllables that are closed by certain consonants. For example, the underlying *-rā* morpheme of the Pluperfect surfaces as *-ra* in the 1s and 3s forms, where it appears in syllables closed by /m/ and /t/ respectively.

Beyond these effects, there is also an alternation between /i/ and /e/ in the Asp[perf] morpheme. This is the effect of a *Lowering* rule, which is formulated as follows:²

(6) *Lowering*

$i \rightarrow e$ in env. ___r

This rule accounts for the fact that the Asp[perf] head surfaces as *-vi* in e.g. the Pluperfect Subjunctive, but as *-ve* in the Pluperfect Indicative, where the /i/ immediately precedes the /r/ of the Tense exponent.

When the system of Latin verbal morphology is considered beyond the Perfect, there is motivation for additional morphophonological rules beyond those mentioned in the text. One important one is *Rhotacism*, which changes /s/ to /r/ intervocalically:

(7) *Rhotacism*

$/s/ \rightarrow /r/$ in env. V__V

This rule accounts for a number of alternations between /s/ and /r/ found in Latin verbs. For example, the infinitival suffix surfaces as *-se* with the athematic verb *es-se*, but as *-re* with other verbs like *amā-re*. With the *Rhotacism* rule (7), it is possible to derive these two surface realizations from a single *-se* infinitival exponent.

With *Rhotacism*, the Tense exponents in (3) can be treated as in (i):

- (i) Pluperfect Indicative: *-sā*
- Perfect Subjunctive: *-sī*
- Pluperfect Subjunctive: *-s, -sē*
- Future Perfect: *-sī*

The effects of *Rhotacism* and the general set of assumptions just outlined are seen in various examples from Latin presented throughout this book. See also Embick and Halle (in prep.) for extensive discussion of this and related points.

In short, the structure that is presented in (1) underlies the different forms in (3), which are subjected to the morphological and phonological processes outlined immediately above.

Returning to the question of agreement allomorphy, it can be seen in the first column of verbs in (3) that the perfect indicative shows more than one “special” agreement allomorph. So, for example, there is typically *-ō* or *-m* for 1s agreement in Latin, but in the perfect indicative, 1s is *-ī*; 2s typically shows *-s*, but in the perfect indicative it is *-istī*; similar considerations extend to 2p and 3p agreement. The agreement endings seen with the other perfect forms in (3) are not unique to perfects; they are found in other parts of the verbal system, as can be seen in the presents and imperfects in (8):

(8) Present and Imperfective Indicative of *amō*

P/N	Present	Imperfect
1s	am-ō	amā-ba-m
2s	amā-s	amā-bā-s
3s	ama-t	amā-ba-t
1p	amā-mus	amā-bā-mus
2p	amā-tis	amā-bā-tis
3p	ama-nt	amā-ba-nt

In the perfects in (3), it is clear that the special allomorphs appear when the AGR node is linearly adjacent to the perfect morpheme (cf. Carstairs (1987), Carstairs-McCarthy (2001,2003), Adger et al. (2003); Lieber (1992) discusses this same point, with reference to (the absence of) percolation in perfect forms). A glossed segmentation showing this is provided in (9), for the first person singular perfect indicative and pluperfect; the underlying forms of the exponents is shown prior to the application of the phonological rules discussed above:

- (9) a. amāvī
 am -ā -vi -∅ -ī
 love TH ASP TNS AGR
 ‘I loved’
- b. amāverām
 am -ā -ve -sā -m
 love TH ASP TNS AGR
 ‘I had loved’

The Tense node in the perfect indicative is always null. Whenever an overt tense morpheme (or overt tense and mood morphemes) intervene between AGR and the Aspectual head Asp[perf], the “normal” exponents of AGR– i.e., those that surface in (8)– are found.

The linear nature of this effect is important in comparison with exclusively cyclic and hierarchical theories of allomorphic locality. Beginning with the former, there is no reason to think that the perfect indicative differs from the other perfects in terms of its cyclic structure. According to standard definitions of cyclic domains, AGR is in the same cycle as Asp[perf] in both the perfect indicative and e.g. the pluperfect indicative. Even if T were assumed (against many current working hypotheses) to be a phase-defining head, the relevant differences could not be stated. Each type of perfect listed here has a T head, as far as the syntax goes. Thus if the spell out of the AGR nodes for the perfect had a cyclic conditioning environment, we should find identical AGR endings *-ī, -istī* etc. in all of the different types of perfects in (3), contrary to fact.

Similarly, it is difficult to see how a hierarchical notion of “command” would have AGR in a local environment with the Asp[perf] head only in the perfect indicative. It might be possible to stipulate a condition on intervening nodes, but this only recapitulates the intuition that the effect is linear, and makes no novel predictions that can be tested.

To account for the special allomorphs of AGR, I propose that in the perfect indicative, the head T[pres] has a zero exponent, and that it is Pruned.³ The VIs inserting the special AGR forms may then be specified for a contextual condition where Asp[perf] is concatenated with AGR, as illustrated with the following VIs:⁴

(10) VIs: A Fragment of AGR in Latin

1s	↔	-ī	/Asp[perf] ^ __
2s	↔	-istī	/Asp[perf] ^ __
2p	↔	-istis	/Asp[perf] ^ __
3p	↔	-ērunt	/Asp[perf] ^ __
1s	↔	-ō	
2s	↔	-s	
2p	↔	-tis	
3p	↔	-nt	

In the perfect indicative, the AGR node is concatenated with Asp[perf], so that the “special” VIs in (10) win over their counterparts that are not specified contextually in this way. In all of the other parts of the perfect system, there are overt exponents for T. These nodes are not Pruned in the way that T[pres] is. Thus the local relationship with Asp[perf] is not found, and AGR defaults to the VIs employed elsewhere in the system.⁵

3.1.2 Some Latin Themes

Another type of effect that implicates linear adjacency is seen in Latin *theme* vowels. I assume that Theme morphemes are, in general, “ornamental” pieces of morphology, items that are apparently relevant for morphological well-formedness, but not part of syntax; these are *dissociated* morphemes in the terminology of Embick (1997). Latin verbs show the different theme vowels in (11):

(11) Conjugations and Theme Vowels

Conjugation	Example	Theme Vowel
I	laud-ā-mus	-ā-
II	mon-ē-mus	-ē-
III	dūc-i-mus	-i-
III(i)	cap-i-mus	-i-
IV	aud-ī-mus	-ī-

Except for the -i- theme posited with Conjugation III verbs like *dūcō*, this is a relatively uncontroversial view of the theme system. It suffices for the purposes of this discussion that the theme of verbs like *dūcō* be a short -i- that is different from that found with III(i) “-io” verbs like *capīō*.

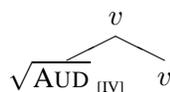
The fact that a particular Root belongs to a particular conjugation class— e.g. that *aud-ī-re* ‘hear’ belongs to conjugation IV with theme vowel -ī- as opposed to some other conjugation— is not predictable. A natural assumption about diacritic declension or conjugation class features with this property is that they are specified as properties of individual Roots, as shown in (12):

(12) $\sqrt{\text{AUD}}_{[\text{IV}]}$

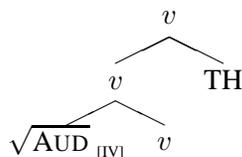
The feature [IV] is neither a semantically interpretable feature, nor is it an uninterpretable feature in the sense familiar from syntactic theory. Rather, it is a diacritic with effects that are seen in the PF derivation, where it determines the spell-out of the theme vowel.

I assume with Oltra-Massuet (1999) that the theme vowels are realizations of a TH position that is added to *v*:⁶

(13) Input



(14) TH Added



When the object in (14) is linearized prior to VI, the TH node and the Root are concatenated, after the (null) *v* is Pruned. The TH node is in the context of an element with the feature [IV], and

is spelled out with the following VI:⁷

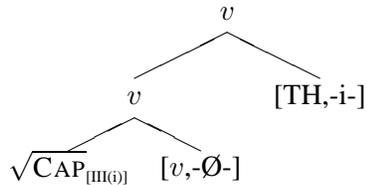
$$(15) \quad \text{TH} \leftrightarrow \bar{i}\text{-}/[\text{IV}] \frown \text{---}$$

The cases in which locality considerations play a role in the theme system involve derivations where v has an overt exponent. For example, the conjugation III(i) Root $\text{cap-i-}\bar{o}$ ‘take, seize’, which takes the short $-i-$ Theme, appears in a “desiderative” form $\text{capess}\bar{o}$ ‘take/seize eagerly’, where the Root is suffixed with the desiderative exponent $-ess$. This exponent can be treated as a spell-out of a type of v , $v[\text{des}]$. Notably, verbs with the exponent $-ess-$ is always inflected as a verb of conjugation [III]: 1s $\text{cap-ess-}\bar{o}$, 1pl cap-ess-i-mus , etc. This suggests that this exponent is itself inherently specified for the class feature [III]:

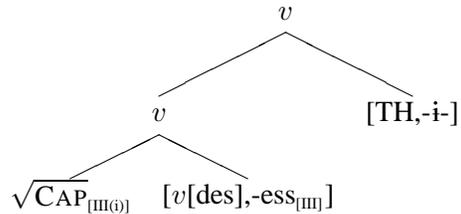
$$(16) \quad \text{ess}_{[\text{III}]}$$

When the Root $\sqrt{\text{CAP}}$ appears with other types of v , whose exponent is $-\emptyset$, the feature visible to the TH node is a feature of the Root itself, as in (17). However, this is not the case when $-ess$ appears as the exponent of $v[\text{des}]$, as shown in (18):

(17) Lower Structure for capimus



(18) Lower structure for $\text{capess}\bar{o}$



That is, the fact that the TH position attached to v sees the feature [III] of the exponent $-ess$ in (18) and not the [III(i)] feature of $\sqrt{\text{CAP}}$ is a matter of locality: the TH head sees the feature of the terminal that it is concatenated with, which in (18) is the [III] feature of $-\text{ess}_{[\text{III}]}$ and not the [III(i)] of $\sqrt{\text{CAP}}_{[\text{III}(i)]}$. This is a further illustration of linear intervention.

3.2 Illustrations II: Cyclicity and Domain Effects

The general principle (SO1) of cyclic spell out employed in the theory of Chapter 2 holds that a cyclic head triggers spell out of cyclic domains in its complement. One consequence of this theory is the DOMAIN COROLLARY, repeated in (19):

- (19) DOMAIN COROLLARY: In the PF cycle of spell out triggered by the merge of cyclic head x , x is *not* subjected to Vocabulary Insertion (and thus cannot undergo any phonological processing). VI does not occur at x until the next cycle of spell out, when it is in the *domain* of another cyclic head.

Two important sets of empirical predictions stem from the DOMAIN COROLLARY. First, cyclic x cannot *Fuse* with outer, cyclic y . Second, cyclic x cannot be sensitive to outer, cyclic y for purposes of Vocabulary Insertion; however, x show allomorphy determined by outer, non-cyclic heads in its domain. These predictions are examined in turn in the following subsections.

3.2.1 No Fusion in “Derivational” Morphology

It is assumed above that category-defining heads are cyclic. These heads are typical derivational morphemes, in the sense that they categorize what they attach to. The DOMAIN COROLLARY (19) holds that cyclic heads are always subjected to VI in different cycles. In this way, the theory accounts for an observation that has been made at various points in the literature to the effect that there are no *portmanteaux* or *fused* affixes in derivational morphology (e.g. Anderson 1992:76, citing Perlmutter p.c.).⁸ While cases of fusion are widely attested in other domains, e.g., case/number morphemes, fusion of agreement and tense, and so on, the behavior of category-defining heads seems to be strikingly different, and, importantly, this difference follows from a theory with cyclic spell out.

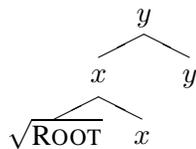
An operation of *Fusion* in which two pieces are combined into one prior to Vocabulary Insertion is argued for in Halle and Marantz 1993. The Fusion of morphemes occurs when the basic morphosyntactic structure involves two separate nodes X and Y . Under particular circumstances—i.e., when X and Y contain particular features—these nodes can be Fused into one object. A Fusion rule is schematized in (20), where α and β are features of X and Y :

$$(20) \quad [X \ \alpha] \frown [Y \ \beta] \longrightarrow [X/Y \ \alpha, \beta]$$

Rules of this type must precede VI. The output of Fusion yields one piece, so that VI inserts only one exponent.

In the \mathbb{C}_1 -LIN theory (more generally, in any theory with (SO1)), the absence of fusion with cyclic heads is a consequence of how spell out works. To illustrate this, consider the structure in (21), which consists of a Root and two category defining heads x and y :

(21) Structure



When x is merged syntactically, it triggers spell out of phases in its domain. In the cycle of spell-out that is triggered when y is merged, the same principle causes spell out of the phase head x and attendant material in the domain of y . Thus, when x undergoes VI in this cycle, y is not present. Only later, in a cycle triggered by other (i.e. outer) material, is the head y spelled out. Since x must undergo VI in a PF cycle in which y is not present, the theory makes fusion of cyclic heads with each other impossible.⁹

3.2.2 Interactions with multiple cyclic heads

Another set of predictions of the \mathbb{C}_1 -LIN theory is seen in structures that have more than one cyclic head in them: $[[\sqrt{\text{ROOT}} \ x] \ y]$. Chapter 2 shows in detail how x , but not y , could show allomorphy conditioned by the Root, or material in the complement of x , in this kind of configuration.

In the type of case just mentioned, the allomorphic sensitivity goes in the “inwards” direction. As also discussed in Chapter 2, the theory makes further predictions concerning “outwards” sensitivity of heads. In particular, while y may show allomorphy determined by x , in $[[\sqrt{\text{ROOT}} \ x] \ y]$, the reverse is not true: an inner cyclic head like x may not have its allomorphy conditioned by an outer cyclic head. This prediction derives from the assumption that it is cyclic domains in the

complement of cyclic heads that are spelled out. In $[[\sqrt{\text{ROOT}}\ x]\ y]$, the elements that are spelled out when y is merged are in the cyclic domain headed by x , or the nodes attached to it (any edge⁺ material that might be present). In this cycle, the head x is subjected to VI. Crucially, because y is not present in this cycle, the head x cannot show outwards sensitive contextual allomorphy to y .

It is possible to find cases that look like *prima facie* counterexamples to this prediction. The discussion in 3.2.2.1 looks at an example from Hindi in which a “causative” morpheme appears to show outwards sensitivity to another causative head. If these heads were both cyclic (i.e. both v), this would be contrary to the predictions just reviewed. However, it is shown that there is an alternative analysis in which no outwards sensitivity is required.

While outwards sensitivity of a cyclic head to another cyclic head is not possible, it is possible for a cyclic head x to have its allomorphy conditioned by an outer, non-cyclic heads that are attached to x 's cyclic domain. This phenomenon is illustrated below in 3.2.2.2 with reference to the phenomenon of *suppletion*.

3.2.2.1 Hindi Causatives

Certain patterns of allomorphy in Hindi causative constructions looks like a case in which an Inner cyclic head sees an Outer cyclic head for allomorphy. In particular, a head that shows Root-determined allomorphy between $-aa$ and $-\emptyset$ in transitives invariably shows the $-aa$ allomorph in a type of causative construction. If this head were a cyclic head— i.e., v — then this would look like a case in which a v head has its allomorphy determined by an outer (“causative”) v head. However, it is argued below that the head showing $-aa$ and $-\emptyset$ is not in fact cyclic v ; it is a non-cyclic Voice head.

The discussion of Hindi here draws on unpublished work by Bhatt and Embick (2003). The head that shows the relevant allomorphic pattern is seen in some different verbal structures. One is a transitivity alternation of the causative/inchoative type. In Hindi, there are, from a morphological point of view, two types of transitivity alternation, shown in (22):

(22) Intransitive/Transitive Alternations

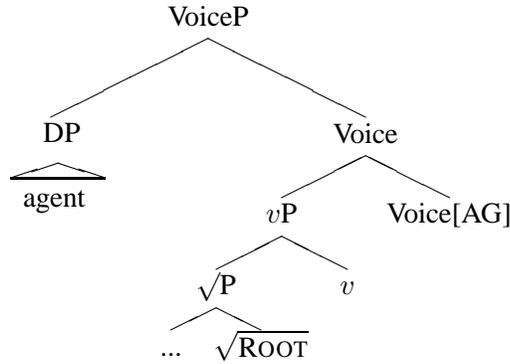
	Intransitive	Transitive	Gloss
a.	bāt-naa	bāāt-naa	‘be divided/divide’
	chhil-naa	chhiil-naa	‘be peeled/peel’
	ḍhal-naa	ḍhaal-naa	‘shape/sculpt’
	ghir-naa	gher-naa	‘be surrounded/surround’
b.	bach-naa	bach-aa-naa	‘be saved/save’
	chamak-naa	chamk-aa-naa	‘shine’
	chhip-naa	chhip-aa-naa	‘hide’
	gal-naa	gal-aa-naa	‘melt’

In the intransitives of both the (22a) and (22b) types, there are no overt exponents.¹⁰ In the transitive, the two classes are different: in the (22a) cases the transitive shows a head that is pronounced $-\emptyset$, whereas in the (22b) cases, this head is pronounced $-aa$.

An important question is what type of head shows the $-aa/-\emptyset$ alternation. The analysis I present takes it to be a *voice* head associated with agentivity; see Kratzer 1994,1996 and Pytkäinen 2002. The voice head is a non-cyclic head that appears outside of the v head that verbalizes these Roots.

The structure for transitives is thus as follows, where Voice[AG] is the head that introduces agentive semantics:

(23) Transitive Structure



Returning to the forms in (22), there are a number of verbs in each of these classes, and membership in one or the other seems to be idiosyncratic, although there are some tendencies in terms of the semantics of the Roots in each class. Part of the analysis of Voice allomorphy must therefore take into account this Root-specific contextual factor, by having the Voice[AG] head spelled out as either *-aa* or \emptyset depending on the Root it is attached to.

An additional component of Voice allomorphy is seen in what can be called the *indirect causative*. This is a structure which, to a first approximation, is a type of sentential causative:

- (24) zamiindaar-ne (ḍakaitō-se) makaan jal-**vaa** diy-aa.
 landlord-Erg bandits-Instr house.M burn-CAUS GIVE-PERF.M
 ‘The landlord had the house burned (by the bandits).’

Syntactico-semantically, this kind of causative has a causative *v* (with its own Voice head) that takes a passive VoiceP as its complement. Morphologically, the indirect causative shows the *-vaa* component that is boldfaced in (24).

There is an interesting effect when it comes to the behavior of *-aa-* and \emptyset -class verbs in the indirect causative, which is seen in comparison with the morphological form of the transitives. There is uniformly *-vaa* in the indirect causative, not *-aa-vaa*, even for those verbs that take *-aa* in the transitive, i.e., the verbs in (25b):

(25) Forms of *vaa*-Causatives

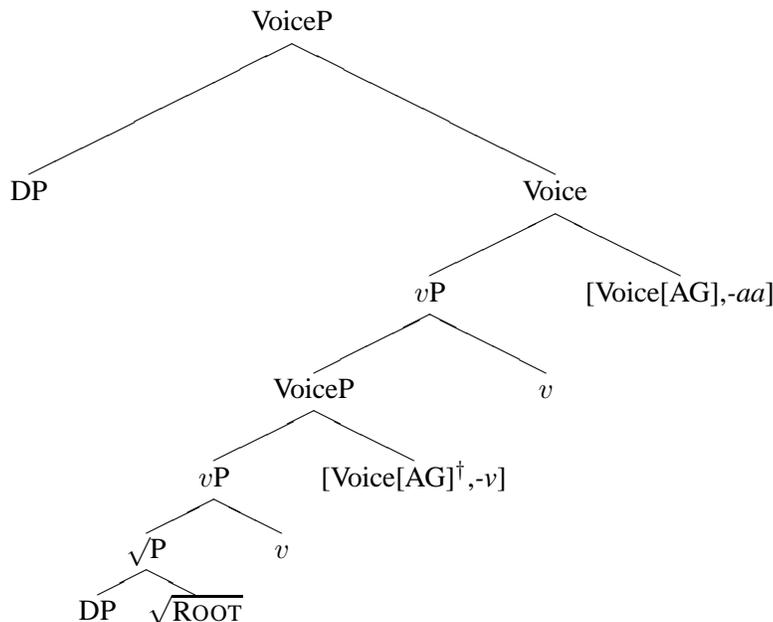
	Intransitive	Transitive	Ind. Caus.
a.	bāṭ-naa	bāṭ-naa	bāṭ- vaa -naa
	chhil-naa	chhiil-naa	chhil- vaa -naa
	ḍhal-naa	ḍhaal-naa	ḍhal- vaa -naa
	gir-naa	ger-naa	gir- vaa -naa
b.	bach-naa	bach-aa-naa	bach- vaa -naa
	chamak-naa	chamk-aa-naa	chamək- vaa -naa
	chhip-naa	chhip-aa-naa	chhip- vaa -naa
	gal-naa	gal-aa-naa	gal- vaa -naa

The realization of *-vaa* across the board is somewhat unexpected, in the sense that the lower Voice[AG] head that is realized as *-aa* with the transitive forms in (25b) does not appear when this agentive is embedded under the causative structure. That is, if the indirect causative is formed by simply adding to the transitive a *v* head (or a *v* head and a Voice head) that is pronounced *-vaa*, then we expect to find **bach-aa-vaa-naa* etc., but this never happens.

The alternation between *-aa* and \emptyset in transitives and indirect causatives highlights the question of “outwards sensitivity” raised at the beginning of this section. This might appear to be a case of outwards sensitivity of cyclic heads, such that a *v* head that is pronounced *-aa* in transitives is pronounced \emptyset when it is in the complement of another *v* head. However, if *-aa* realizes a Voice[AG] head in transitives, as suggested above with reference to (23), the interaction is not between two cyclic heads. Rather, the fact that *-aa* does not appear in Indirect causatives is a result of the VoiceP in these constructions being passive, not active. This passive head– Voice[AG][†]– licenses agentive semantics but not an external argument (see Embick 2004b); crucially, it has its own allomorph that beats both *-aa* and \emptyset .

Additional details of this analysis involve a closer look at the *-vaa* that appears in indirect causatives. According to the analysis outlined in Bhatt and Embick 2003, *-aa* does not surface in the (25b) cases because the *-vaa* morpheme is actually two morphemes: a *-v-* spell out of the lower “passive” voice head, Voice[AG][†], along with the *-aa-* exponent seen elsewhere in the system for the higher Voice[AG] of the Indirect Causative. This analysis is shown in (26):¹¹

(26) indirect causative



In the derivation of the indirect causative (26), a first cyclic domain is created when the lower *v* is merged with the Root. This *v* head has the passive Voice[AG][†] merged with it. When the second *v* is merged, it triggers spell out of cyclic domains in its complement. In this cycle of PF, the lower *v* is realized with a null exponent, and the head Voice[AG][†] has *-v* inserted.

In the subsequent PF cycle in which the outer *v* and its Voice head undergo Vocabulary Insertion, \emptyset is inserted at *v*, and *-aa* for Voice[AG]. The fact that *-aa* is inserted invariably in this context

follows from locality: there is no possibility for Root-determined allomorphy at this head, because the Root is cyclically inaccessible. Thus, the default *-aa* appears.

With the following VIs, then, the distributions described above are accounted for:¹²

(27) Spell out of Voice heads in Hindi

Voice[AG] [†]	↔	-v-
Voice[AG]	↔	-∅- /LIST1 $\hat{\ } _ _$ LIST1 = Roots in the Null class
Voice[AG]	↔	-aa-

In short, there are two components to the analysis. First, the analysis of causativization involves two heads, *v* and Voice; and the overt morphemes seen in Hindi are realizations of the latter. Second, the Vocabulary Item with *-v* beats those with *-aa* and *-∅* in the indirect causative context, because the head that is being spelled out is passive.¹³

3.2.2.2 Domain Effects in Stem Suppletion

The \mathbb{C}_1 -LIN theory allows certain types of outwards sensitivity, but disallows others. This aspect of the theory is important in cases of “stem suppletion” of the type often associated with extremely common verbs like *be*, *go*, etc. Suppletion is, of course, highly irregular, and it is moreover not necessarily a uniform concept. Any systematic investigation of suppletion would have to address a number of issues that are far beyond the scope of the present discussion.¹⁴ However, it appears that in a core set of cases, a number strong predictions can be made about the factors that could trigger stem suppletion.

Many instances of suppletion are found with elements that could plausibly be the types of morphemes that show contextual allomorphy. Canonical cases like those mentioned above— *be*, *go*, etc.— are *light verbs*: members of the functional vocabulary. Marantz (1995) and others have emphasized that within a theory with some late insertion, restricting suppletion to the functional vocabulary is an important desideratum.¹⁵ In this type of theory, suppletion is simply contextual allomorphy, but with “free-standing” verbs etc. rather than with affixed morphemes. Thus, the fact that the element being realized is a verb— i.e., a kind of *v*— makes it more noticeable than other types of allomorphy, but the mechanisms for handling these effects, involving competing VIs, are the same whether the object in question is an affix or a “stem”.

In the present context, it is of course expected that suppletion in this sense, as the result of contextual allomorphy, should be subject to the locality conditions expressed in the \mathbb{C}_1 -LIN theory. One illustration of this point, which implicates the DOMAIN COROLLARY (19) as well, is seen with the suppletion of the light-verb *go*, which is the spell out of a functional head that I abbreviate with v_{go} . The VIs that apply to this morpheme are given in (28), where, crucially, the first makes reference to Tense:

(28)	v_{go}	↔	went/ $_ _$ T[past]
	v_{go}	↔	go

With respect to the DOMAIN COROLLARY, the important point is that v_{go} , a cyclic head, cannot be spelled out phonologically in the cycle that it induces. This is clear from the fact that if Vocabulary Insertion applied to v_{go} itself in the cycle determined by that head, then v_{go} would be spelled

out before being merged with T, and suppletion of v conditioned by T would be impossible. If, on the other hand, v_{go} is not itself subjected to VI until a later cycle, this type of pattern can be handled straightforwardly.

The general prediction of the C_1 -LIN theory is that a functional head can have its allomorphy determined by linearly adjacent outer material up to the next cyclic domain. The schema in (29) illustrates this and some further points:

$$(29) \quad \dots x] W] y]$$

A cyclic head x showing suppletion could be sensitive to the presence of W . However, x could not be sensitive to phonological properties of W , on the assumption that Vocabulary Insertion proceeds from the inside-out. Beyond W , x could show no sensitivity to outer cyclic y at all; y is not present when x undergoes insertion. In well-studied cases of suppletion, the first part of this prediction appears to be correct. That is, the factors that condition stem-suppletion of light-verbs like English *go* or *be* are morphosyntactic: either Tense features, person/number features, or a combination of Tense and person/number features, condition the allomorphy of these v heads.

In more complicated cases, some additional questions arise. For example, according to the formulation of Chapter 2, the Pruning rule that eliminates nodes with $-\emptyset$ exponents follows VI. For VI at a light verb v in a syntactic structure $[[v \text{ Tense}] \text{ AGR}]$, it should therefore be expected that v could supplete only on the basis of T's features, and not those of AGR.

Some questions along these lines can be seen in the behavior of Latin *esse* 'be'. In the present indicative— the first column in (30a), there is an alternation between *es-* and *su-* depending on the person and number of the subject. In other tenses, suppletion of *esse* is not affected by person and number features. In the past and future tenses (30b-c), the stem *es-* (with the /s/ Rhotacized intervocalically to yield surface /r/) appears; and in the perfect tenses (30d-f), the stem is *fu-*:

(30) Indicative: *esse*

	a.	b.	c.	d.	e.	f.
	Present	Imperfect	Fut.	Perf.	Pluperfect	Fut. Perfect
1s	su-m	er-a-m	er-ō	fu-ī	fu-e-ra-m	fu-e-r-ō
2s	es	er-ā-s	er-i-s	fu-istī	fu-e-rās	fu-e-ri-s
3s	es-t	er-a-t	er-i-t	fu-i-t	fu-e-ra-t	fu-e-ri-t
1p	su-mus	er-ā-mus	er-i-mus	fu-i-mus	fu-e-rā-mus	fu-e-ri-mus
2p	es-tis	er-ā-tis	er-i-tis	fu-istis	fu-e-rā-tis	fu-e-ri-tis
3p	su-nt	er-a-nt	er-unt	fu-ē-r-unt	fu-e-ra-nt	fu-e-ri-nt

Some aspects of (30) are straightforward. As discussed in 3.1 above, the perfect tenses in Latin contain a head $\text{Asp}[\text{perf}]$ between v and Tense. Clearly, then, the *fu-* allomorph is inserted in the context of this perfect head. Moreover, it appears that the *es-* stem is the default:

$$(31) \quad v_{be} \leftrightarrow \text{fu}/__ \wedge \text{Asp}[\text{perf}]$$

$$v_{be} \leftrightarrow \text{es}$$

This leaves the *su-* forms, which appear to be conditioned by person and number features. The question is as follows: if the structure of these forms is $[[v_{be} \text{ Tense}] \text{ AGR}]$, and Tense cannot be Pruned until it undergoes VI, how could v_{be} be sensitive to person/number features?

There are two kinds of answer that can be given to this question. One possibility is outlined at the end of Chapter 2. It was noted there that in a theory with AGREE, person and number features

of the subject are present on the Tense node. It could be the case, then, that what v_{be} is sensitive to are valued ϕ -features on T, and not features on the AGR node per se. In this particular case, the spell out of v_{be} would have to be made sensitive to certain ϕ -features, and moreover, only on present tense T[*pres*]. The restriction to this particular head is forced by the fact that the past and future tenses do not show any variation driven by person and number in v_{be} 's shape (30b,c).

A variant of the solution just discussed is that v_{be} and T[*pres*] are Fused when T[*pres*] has certain ϕ -feature values (.e. in those cases where the stem is *su-*). Then the Vocabulary Items for v_{be} would be as follows:

- (32) $[v_{be}, T] \leftrightarrow su$
 $[v_{be}] \leftrightarrow fu/_ \wedge Asp[perf]$
 $[v_{be}] \leftrightarrow es$

If the Fusion rule combines v_{be} only with T[*pres*] with 1s, 1p, and 3p features, then *su-* is inserted into the correct environments by the first VI in (32). Overall, though, this type of account deals with person/number-driven suppletion without ordering problems relating to Pruning.¹⁶

A second type of analysis is based on the general idea that present, indicative tense (T[*pres*]) plays no role in Latin morphology. As discussed in Embick and Halle (in prep.), this might be the result of a general “radical” Pruning rule that takes place early in PF derivations involving T[*pres*], eliminating this node from the representation. According to this account, v_{be} would be adjacent to AGR in the present indicative, and the *su-* allomorph would be sensitive to the person number features on the AGR node.

Determining the viability of these different options in case of Latin *esse* and other examples along these lines raises a number of important questions that could be addressed in a more sustained study of suppletion. For present purposes, the important point is that the C_1 -LIN theory narrows down considerably the kinds of information that are available for outwards-sensitive allomorphy. While there are many cases in which suppletion is conditioned by outer morphemes (and perhaps their features), there are no cases in which the phonology of outer morphemes, or the output phonology of a particular form, plays a role in conditioning suppletion. This behavior is expected on a Localist theory like that presented here, which restricts the number of factors that could play a role in allomorphy. Some important consequences of this view are examined in greater detail in Chapter 6, where further aspects of suppletion are considered with reference to the predictions of Globalist theories.

3.2.3 French Prepositions and Determiners: A Question about Cyclic Heads

On the general theme of how different types of heads interact with each other, one question for a cyclic theory is how category-defining cyclic heads like *n*, *v*, etc., relate to other domains that are hypothesized to be cyclic on syntactic grounds, such as CP and DP. That is, if spell out targets phases headed by category-defining heads, does it also target DPs and PPs? The general set of questions that is at play here can be seen in the interaction of Prepositions and Determiners in French, where different assumptions about which heads define spell out domains force different types of analyses.¹⁷

As discussed in Embick 2007b, two PF processes in French interact in a way that appears to implicate cyclic spell out. The first process is seen with (singular) definite articles, which exhibit a close phonological union with following vowel-initial elements:

- (33) a. le chat ‘the cat’ (masc)
 la mère ‘the mother’ (fem)
- b. l’arbre ‘the tree’ (masc); *le arbre
 l’abeille ‘the bee’ (fem); *la abeille

I refer to this as *Article Cliticization*, even though it might be more general; it operates under linear adjacency and is sensitive to the phonology of the target. *Article Cliticization* is a rule of *Local Dislocation*, which adjoins definite D to vowel-initial elements when they are concatenated (cf. (35a) below).

The second process is one that creates what are sometimes referred to as “fused” prepositions/determiners. Such forms are found with the prepositions *à* and *de*, and the masculine and plural definite articles:

(34) Examples of Prepositions and Determiners

	“Fused”	Separate	Gloss
(Fem.)	*	de la mère	‘of the mother’
	*	à la mère	‘to the mother’
	aux mères	*à les mères	‘to the mothers’
(Masc)	du chat	*de le chat	‘of the cat’
	au chat	* à le chat	‘to the cat’
	aux chats	*à les chats	‘to the cats’

The use of the term “fused” here is descriptive, and not technical. The analysis of this effect could posit either one or two Vocabulary Items in *du*; only in the former case would there be *Fusion* in the technical sense. These matters are clarified below.

Based on the patterns in (34), there must be a rule of *Preposition-Determiner Affixation* that affixes certain Prepositions to masculine and plural definite determiners.

The two rules discussed above are stated in (35), in a formulation that treats each as an instance of *Local Dislocation*.¹⁸

(35) PF Rules: French

- a. *Article Cliticization*:
 $D[\text{def}] \wedge X \longrightarrow [D[\text{def}][X]]$, X vowel-initial.
- b. *P-D Affixation*:
 $P^+ \wedge D[\text{def}]^+ \longrightarrow [P^+[D^+]]$

where ⁺ is a diacritic for the particular terminals that are subject to this process.

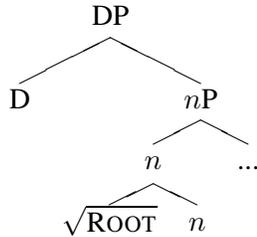
The interaction of these two rules is seen in cases in which either of these processes could apply: i.e., with masculine nouns that are vowel-initial. In examples of this type, *Article Cliticization* applies, and *P-D Affixation* thus does not apply:

- (36) a. de l’arbre
 b. *du arbre

As discussed in Embick 2007b, the fact that *Article Cliticization* is found appears to be natural in a cyclic theory: specifically, the correct results would be derived if the DP is spelled out prior to the cycle in which P and D are processed together.

Implementing a cyclic analysis in detail implicates the questions posed at the beginning of this section, concerning which nodes constitute cyclic domains. To begin with, the first stage in the analysis is a structure in which D is merged with the *nP*:

(37) Stage 1



In determining how this DP is spelled out, the status of P as a cyclic or not cyclic node is critical; possible analyses of the interaction rules in (35) differ depending on whether or not P is present in the same PF cycle in which D undergoes VI.

Before addressing further the status of P, the specifics of how different types of DPs are spelled out must be presented. These are as follows. When a DP is spelled out, PF computes linearization statements that contain the information that D is concatenated with the noun:

(38) $D \frown [{}_n \sqrt{\text{ROOT}} n]$

At this point, one of two things can happen: either the rule of *Article Cliticization* applies, or it does not, depending on the phonological properties of the nominal.

With V-initial nouns, D is affixed to N by (35a). The output of this rule is shown in (39a). This structure is then linearized to produce (39b) (recall that \oplus is short-hand for M-Word internal concatenation, and that $^+$ picks out those P's and D's subject to the rule):

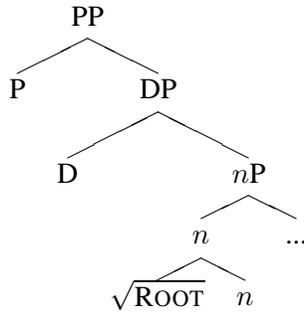
(39) PF: Cliticization

- a. $D^+ \frown [{}_n \sqrt{\text{ARBRE}} \oplus n] \longrightarrow [D^+ [{}_n \sqrt{\text{ARBRE}} \oplus n]]$
- b. $D^+ \oplus \sqrt{\text{ARBRE}}, \sqrt{\text{ARBRE}} \oplus n$

When *Article Cliticization* does not occur, the PF representation for the DP is that given in (38) above, which has D concatenated with the noun, but not affixed to it.

The next step is to consider what happens when a DP is the complement of a preposition. Syntactically, the object in question is shown in (40):

(40) Stage 2



For the question of how spell out of this object proceeds, there are two scenarios to consider:

- (41) a. **Scenario 1:** P is a cyclic node. Thus the DP is spelled out without reference to P’s presence.
 b. **Scenario 2:** P is not a cyclic node. Thus the DP is spelled out in a cycle in which P is also present

Assuming Scenario 1, D must be spelled out in a way that shows no sensitivity to P. This means that in the case of e.g. a masculine singular noun, the exponent *le* is inserted at D. Thus, there is no possibility of positing a VI for the prepositional environment with a “reduced” exponent, like *-e* or *-u*, and having this beat *le* when necessary. Relatedly, it would be impossible to fuse D and P prior to Vocabulary Insertion, and have e.g. *du* realize a single node. Instead, the morphophonology must, evidently, be capable of deriving *du* from *de* and *le*.

Assuming Scenario 2, P is not a cyclic node. This might weaken certain syntactic predictions, but it does not complicate the morphophonology as much as Scenario 1 does. The most important aspect of Scenario 2 for these purposes is that VI at D could be made sensitive to the presence of P. Thus, for example, a PF rule could adjoin P and D so that they are in the same complex head, and then specific “head internal” allomorphs of D would be inserted in this particular environment. There are several different ways of doing this, depending on how much burden is put on the Vocabulary versus the morphophonology. For example, one possibility would be to simply have “vocalic” allomorphs of D inserted in a complex head with P:

- (42) $D[\text{def,masc}] \leftrightarrow e/P^+ \oplus \underline{\quad}$
 $D[\text{def,masc}] \leftrightarrow le$

In this way, the more specific “head internal” allomorph *-e* wins out over the less fully specified ones. After the insertion of *d(e)* and *à* for the P position, the (morpho)phonology must operate to produce the effects in (43):

- (43) $d(e)\text{-}e \rightarrow du$
 $d(e)\text{-}e\text{-}s \rightarrow des$
 $\grave{a}\text{-}e \rightarrow au (/o/)$
 $\grave{a}\text{-}e\text{-}s \rightarrow aux (/oz/)$

The first of these processes is clearly “unnatural” (as opposed to the others), but there is really little to say about it except that it must be stated somewhere in the grammar. If it is not the result of a Readjustment Rule, as it would be on the account just sketched, it would be possible to form an analysis with an *-u* allomorph of $D[\text{def,masc}]$, and have this beat the other allomorphs in the relevant environments:

- (44) $D[\text{def,masc}] \leftrightarrow u/P^+ \oplus _$
 $D[\text{def,masc}] \leftrightarrow le$

While either one of the analyses just sketched might be simpler morphophonologically than what falls out of Scenario 1, treating P as non-cyclic has syntactic consequences that must be considered.

There are some additional possibilities that are worth exploring in this type of case. For example, one that avoids some of the difficulties mentioned in the text would be to say that “prepositions” have an internally complex structure (see, for example, Svenonius 2008). If this were the case, then it could be argued that *de* etc. is the spell out of non-cyclic head *P* between a cyclic *p* head and the DP, in which case the *P* and *D* would be spelled out in the same cycle. Such an analysis would allow a simple morphophonological analysis along the lines of Scenario 2, while maintaining the idea that prepositional phrases in the broad sense are cyclic domains, as in Scenario 1.

The cyclicity of derivations plays an important role in all of the analyses outlined above. An important empirical question for future work is whether there are other reasons for assuming P to be cyclic or not. If e.g. both P and D are cyclic, then it is predicted that there should never be fusion of P and D in the technical sense. Given that P/D interactions are not uncommon cross-linguistically, this suggests an interesting avenue for further investigation.

3.3 Case Studies: Inner/Outer Affixation

In Chapter 2, patterns of allomorphy in two types of English nominals were used to illustrate a number of basic points about the behavior of cyclic heads. In that preliminary discussion, the central pattern was the contrast between “special” or “derived nominals”, with a number of different *n* allomorphs (*laugh-ter*, *marri-age*, etc.), versus gerunds, where *n* is realized as *-ing* (*laugh-ing*, *marry-ing*, etc.). The way in which Outer cyclic heads are insensitive to Roots is an important facet of the theory. As discussed in detail in Chapter 2, there is a basic asymmetry in allomorphy that is illustrated in structures like (45):

- (45) $...[\sqrt{\text{ROOT}}] x] W] y] Z$

The (cyclic) head *x* and attached *W* can show allomorphy determined by elements in the complement of *x*, but *y* and *Z* cannot. These effects follow from the \mathbb{C}_1 -LIN theory, in a way that is summarized in the ACTIVITY COROLLARY:

- (46) ACTIVITY COROLLARY: In $[[\sqrt{\text{ROOT}}] x] y]$, where *x* and *y* are both cyclic, material in the complement of *x* is not *active* in the PF cycle in which *y* is spelled out.

The empirical patterns studied in Chapter 2 concern cases in which a head like *n* takes different affixes in the Root-attached versus Outer domains. Another question that arises when the same type of cyclic head attaches in both Inner and Outer domains concerns identity in form. In some cases, identical exponents for e.g. *n* are inserted in both Inner and Outer environments. For example, the exponent *-ing* occurs across the board in English gerunds; but at the same time, there is also an *-ing* that appears in the Inner domain, for nouns like *fill-ing*, *lin-ing* etc. on their non-gerund interpretations. In cases of this type, there are questions about how the Vocabulary represents this identity in form (cf. also Embick (1996) on a related pattern in the Athabascan language Hupa). These points are illustrated in a look at Japanese causatives in §3.3.1, and in a more detailed examination of English nominals in §3.3.2.

3.3.1 Preliminary Predictions: Japanese Causatives

The idea that the same exponent can be inserted in both Inner and Outer heads was touched on earlier in this chapter, in the discussion of Hindi causatives. Recall that while the Voice[AG] heads in Hindi show Root-determined allomorphy in transitives, the same Voice[AG] head shows only the default *-aa* in the Outer domain, with causatives. That is, there is no Root-determined allomorphy; this is what the ACTIVITY COROLLARY predicts.

Another illustration of cross-domain identity in form, one with very similar properties, is found in the behavior of causatives in Japanese, which have been studied in a large literature that is reviewed in Harley 2005. The points to be made here with reference to allomorphy relate directly to work by Miyagawa (1994) and references cited there.

Verbs that appear in transitivity alternations in Japanese show different patterns of morphological marking in the intransitive and transitive alternants (examples selected from Harley 2005, in turn from Jacobsen 1992):

(47) Sample Patterns

Affixes	Intransitive	Transitive	Gloss
-e/- \emptyset	hag-e-ru	hag- \emptyset -u	‘peel off’
- \emptyset /-e	ak- \emptyset -u	ak-e-ru	‘open’
-ar/-e	ag-ar-u	ag-e-ru	‘rise’
-ar/- \emptyset	hasam-ar-u	hasam- \emptyset -u	‘catch between’

Each of the verbs in (47) stands in for sets of different sizes that alternate in this way. Moreover, there are many classes in addition to those illustrated above, but they all show the same basic point: in intransitives and transitives, the allomorphy of this head is Root-determined. For concreteness, I take the exponents seen in (47) to be spell outs of *v* (see also Pylkkänen (2002); for what is presented below, it would be possible to treat these exponents as instantiations of Voice as well).

The patterns in (47) connect with an important pair of observations that are discussed in Miyagawa 1994 and related work. In syntactic causatives— i.e., causatives in which a *v* takes some sort of verbal complement, the causative *v* head is always realized as *-sase*. In addition to this, however, there are some *-sase* affixed forms that have the properties of “lexical” causatives. This latter type of *-sase* form has a *v* head in the Inner domain, where it is Root-attached.

Miyagawa’s observation is that *-sase* is possible as a lexical causative for some Root only when there is no “special” affix of the type illustrated in (47) for that Root. In other words, *-sase* is the default (agentive) *v* head; it is (i) often blocked in the Root-attached domain, where a more specific VI applies, as in (47); and (ii) invariably found in the Outer domain.

The fact that *-sase* is found in Inner and Outer domains is accounted for by positing a VI which is the overall default for the causative *v*:

(48) $v \leftrightarrow -sase$

This VI applies in the Root-attached domain when there is no more specific VI with a contextual condition that beats it. In the Outer domain, it appears across the board because (i) Roots are not visible for Outer *v* heads, and (ii) there is no VI that is specified to occur in this context, i.e., one that is specific to causatives.

According to this analysis, *-sase* appears in both Inner and Outer domains, because the VI with this exponent is a default. In this way, the Japanese pattern is quite similar to what is found

in Hindi. Beyond this type of pattern, where the default occurs in both Inner and Outer domains, identical exponents are also found with non-defaults; a case of this type is examined in the following subsection.

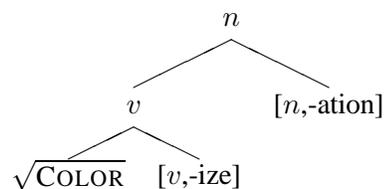
3.3.2 Nominal affixes: The Outer Cycle

In the discussion of English nominalizations above, Root-attached *n* with its many allomorphs is contrasted with Outer *n* in gerunds, where the *-ing* allomorph occurs without exception. While it is true that all nominalizations with the syntax of a gerund show *-ing*, it is not the case that *-ing* is the only exponent that is found for *n* in the Outer cycle. Examples like those in (49) show an outer *n*, outside of a Root verbalized by *v* as shown in (50). The presence of the overt exponent *-ize* signals verbalization; the *n* in these cases is realized as *-ation*, not *-ing*:

(49) Outer *-ation*

Root	Verb	Nominalization
$\sqrt{\text{COLOR}}$	color-ize	color-iz-ation
$\sqrt{\text{ITEM}}$	item-ize	item-iz-ation
$\sqrt{\text{LEGAL}}$	legal-ize	legal-iz-ation
$\sqrt{\text{VAPOR}}$	vapor-ize	vapor-iz-ation

(50) *colorization*



Unlike what is seen in the case of Japanese *-sase*, there is more than one exponent that appears in the Outer domain: both *-ation* and *-ing* appear there.

There are two factors to consider in the analysis of this effect. The first is that the forms like *color-iz-ation* do not have the syntax of gerunds. This can be seen in the fact that gerunds with *-ing* can be formed on *color-ize*, and they are different syntactically from the *-ation* forms: e.g., gerund *John's coloring the movies...* versus non-gerund *John's colorization of the movies...* One way of thinking of this is that the (49) cases have an intransitive Voice head, whereas gerunds possess *v* and the agentive head Voice[AG].

As an abbreviation for these analyses, I will represent the *-ize* type cases— *Z-nominals* for convenience— with a head v^z , which stands for *v* (and the Voice head) found with this type of nominalization; the *n* head attaches outside of these heads. In gerunds, the *n* attaches outside of what I abbreviate as v^g : a *v* head and the (transitive) Voice[AG] head:

- (51) a. **Z-nominal:** $[[\sqrt{\text{ROOT}} v^z] n]$
 b. **Gerund:** $[[[\sqrt{\text{ROOT}} v^g] n]$

The second factor in the analysis is the one that accounts for the appearance of *-ation* in the structure in (51a). This can be treated as a case of potentiation, of the type found with e.g. *-able* and *-ity*; recall 2.2.3 in Chapter 2. In the example employed there, the idea was that the *a* head that is pronounced *-able* is on the list of objects that condition insertion of *-ity*, making the latter affix fully productive after the former. The VI with the *-ity* exponent appears both in the Root-attached domain with *atroc-ity*, *curios-ity*, etc., and in the Outer domain, after e.g. *-able* and *-al*:

- (52) $n \leftrightarrow \text{-ity/X}$
 $X = \text{Roots} (\sqrt{\text{ATROC}}, \sqrt{\text{CURIOUS...}}); [a, \text{-able}], [a, \text{-al}]$

The allomorphy of *n* in Z-nominals can be treated in the same way; the Vocabulary contains a VI that has *-ation* as an exponent, and one of the contextual elements that appears in this VI is the head v^z :

$$(53) \quad n \leftrightarrow \text{-ation/} \text{LIST}^{\wedge} \text{ ___}$$

$$\text{LIST} = \{\text{Roots, ...}v^z\text{...}\}$$

That is, in addition to whatever Roots condition insertion of *-(a)tion* into Root-attached *n*, this exponent is also inserted into *n* that is attached to the v^z pronounced *-ize*. When *n* occurs in the outer cycle outside of v^z , this VI wins over the one with the *-ing* exponent that is seen with gerunds.

To this point, three types of formation with *n* have been considered: special nominalizations, with Root-attached *n*; Z-nominals, with *n* outside of v^z ; and gerunds, where *n* appears outside of the structure abbreviated with v^g .

Taking this part of the English nominal system as a whole, it appears that many VIs apply only in the Root-attached domain, as might be expected in a theory of the type presented in Chapter 2. There are also some exponents that appear in both Inner and Outer domains; e.g. *-ation*, and *-ity*, as well as *-ing*. The last of these is the realization of Root attached *n* in cases like *lin-ing*, *fill-ing*, *hold-ing* (as in *John's holdings are extensive*) and so on.

The appearance of *-ing* in the Inner and Outer domains can be treated as another case of potentiation. The VI with the *-ing* exponent includes on a list that contains a set of Roots, and v^g :

(54) Nominalizations

$$\begin{array}{ll} n \leftrightarrow \text{-al/} & \text{LIST1}^{\wedge} \text{ ___} \\ n \leftrightarrow \text{-age/} & \text{LIST2}^{\wedge} \text{ ___} \\ n \leftrightarrow \text{-tion/} & \text{LIST3}^{\wedge} \text{ ___} \\ n \leftrightarrow \text{-ing/} & \text{LIST4}^{\wedge} \text{ ___} \\ n \leftrightarrow \vdots & \vdots \\ n \leftrightarrow \text{-}\emptyset\text{/} & \sqrt{\text{ROOT}}^{\wedge} \text{ ___} \end{array}$$

$$\text{LIST4} = \{\sqrt{\text{LINE}}, \sqrt{\text{FILL}}, \dots, v^g \dots\}$$

Treating *-ing* along the lines of *-ity* might be motivated along other lines as well. It is not the case that *-ity* is a default in the outer domain; rather, as is well-known, *-ness* appears to be the default for *n* when it attaches outside of *a*. Both *-ing* and *-ness* are thus “defaults” of *n* in some sense. What distinguishes them is the morpheme to which the *n* attaches: *a* in the case of *-ness*, *W* in the case of *-ing*.¹⁹ In some sense, the relationship between *-ness* and *-ing*—coupled with the way in which *-ing* appears in the inner domain—precludes a simple treatment in which *-ing* is the global default for *n*. Further research is required to see if there are alternatives in which the default status of *-ing* can be maintained.

In sum, there are two types of cases in which the same exponent can be inserted into Inner and Outer heads. In one type, seen above in Japanese causatives, the exponent in question is a default. In the second type, illustrated with English nominalizations, the exponents that appear in the Outer domain could be treated as potentiated by inner functional heads, although other options could be explored as well.

3.4 Morphology and Phonology

Having presented in the preceding sections a number of predictions of the \mathbb{C}_1 -LIN theory for allomorphy, I turn now to questions that center on morphology/phonology interactions. While the theory of morphology developed in this part of the book does not necessarily force the details of a phonological theory, some phonological theories fit much better with it than others, as discussed in Chapter 1. In particular, to the extent that there is no evidence for competition among multiple derived objects in syntax and morphology, the most natural assumption would be that the phonological component also functions without competition among multiple complex objects.

This section focusses on three aspects of the interface between morphology and phonology. Section 3.4.1 looks at the status of *Readjustment Rules*: morphophonological rules that are triggered by particular features, such as the rule that changes *break* to *broke* in the context of the past tense head. It is argued that, all other things being equal, such rules should show cyclic locality effects of the type defined by the \mathbb{C}_1 -LIN theory. At the same time, these morphophonological rules might not obey the linear constraint on allomorphy that is seen in Vocabulary Insertion.

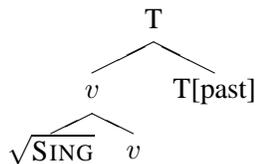
In 3.4.2, I examine some aspects of Phonologically Conditioned Allomorphy from the perspective of the \mathbb{C}_1 -LIN theory. The basic point is that VI may be sensitive to the phonological properties of inner nodes, i.e., those that have undergone VI. Additional questions concern whether *derived* phonological properties could be visible to VI.

Finally, 3.4.3 looks at a case in which it appears that the linear condition on contextual allomorphy is violated: a morpheme in the language Palauan that looks as though it shows Root-determined allomorphy, even though another morpheme intervenes between it and the Root. It is argued that this case shows a phonological process that masks a relationship that is local in the morphology, when VI occurs. The analysis of this effect requires a theory in which the representations employed for VI are not those that are seen in the surface phonology.

3.4.1 Competition for Insertion versus Morphophonology

Distributed Morphology implements a difference between (i) “piece-based” affixation, in which nodes in a syntactic structure are realized via VI, and (ii) *Readjustment Rules*, which are morphosyntactically triggered phonological rules that change the phonology of Roots (and exponents of functional heads as well). The latter type of rule has been alluded to at various points in the discussion above. The effects of such rules can be seen in the derivation of the past tense of the Root $\sqrt{\text{SING}}$, i.e., *sang*. Prior to VI, the structure is (55), where the Root is combined with *v* and T[past]:

(55) Structure for *sang*



The VI process inserts a $-\emptyset$ affix for *v*, which is then Pruned in the way described in the preceding chapter. VI at T[past] can see the Root, and $\sqrt{\text{SING}}$ is on the list for the VI that inserts a $-\emptyset$ exponent for T[past], so that $-\emptyset$ is inserted into this node. In addition to this, $\sqrt{\text{SING}}$ is on the list for a *Readjustment Rule* that is triggered in the context of T[past] (see Halle and Mohanan 1985). This rule has the effect of changing the vowel of the Root, yielding *sang*.

Competition for insertion and Readjustment are distinct in two ways.²⁰ First, a single VI has a coherent distribution, which means that a VI cannot contain a “disjunctive” list of features that are not compatible with one another. A single Readjustment Rule, on the other hand, can be *one rule* at the level of what it does phonologically, but be triggered in a range of environments that do not necessarily have anything in common with one another; German *Umlaut* has this property, as discussed in Embick and Halle (2005), following Lieber (1980). Of course, it is possible for a Readjustment Rule to apply in a coherent environment, but this is not a defining property of such rules.

A second difference is that contextual allomorphy is subject to the considerations of locality outlined in Chapter 2. Readjustment Rules— and, more generally, phonological rules— are not subject to the same *linear adjacency* (LIN) condition that restricts allomorphic interactions. What exactly this means remains to be explored in all its details, but there appear to be cases in which a Readjustment Rule “skips” intervening, overt morphemes. Carstairs-McCarthy (1992) provides an illustration of this point from Zulu, where the passive morpheme *-w* triggers palatalization of labials in the verb stem (56a); this rule applies even when a morpheme like causative *-is* intervenes between the passive and the root (56b):

(56) Zulu palatalization of labials (Carstairs-McCarthy 1992:70)

	Active	Passive
a.	bamb-a ‘catch’ boph-a ‘tie’	banj-wa ‘be caught’ bosh-wa ‘be tied’
b.	bamb-is-a ‘cause to catch’ boph-is-a ‘cause to tie’	banj-is-wa ‘be caused to catch’ bosh-is-wa ‘be caused to tie’

Palatalization of this type is a Readjustment Rule triggered by the passive morpheme. Its effects are manifested across intervening morphemes, unlike what is seen with contextual allomorphy, whose effects are limited to concatenated pieces.

In the examples in (56) the passive morpheme that triggers palatalization is able to skip the intervening causative morpheme. However, while this rule is a Readjustment Rule, in that it is triggered by the passive head, the rule does not make reference to the identity of specific undergoers: it is not Root- or morpheme-specific.

In other cases, it appears that a Readjustment Rule triggered by a particular morpheme only applies to specific elements. One example of this type is found in the behavior of the Classical Greek aorist morpheme, an Aspectual head.²¹ As seen in the first column of forms (57a), the exponent of the aorist morpheme, which appears penultimate in the word, is *-sa*; the only exception to this is the 3s form, which shows *-se*. In the aorist optative active in the second column (57b), the optative has the exponent *-i* after the aorist morpheme; the optative morpheme is followed by an AGR node. It can be seen in (57b) that *-sa* appears for the aorist in only a subset of the person/number combinations; in the 2s, 3s, and 3p, there is *-se* instead of *-sa* (forms from Smyth 1920):

(57) Aorist Forms

	a.	b.	c.
P/N	Indicative	Optative	Optative Middle
1s	é-lū-sa	lŭ-sa-i-mi	lū-sa-í-mēn
2s	é-lū-sa-s	lŭ-se-i-as	lŭ-sa-i-o
3s	é-lū-se	lŭ-se-i-e	lŭ-sa-i-to
2d	e-lŭ-sa-ton	lŭ-sa-i-ton	lŭ-sa-i-st ^h on
3d	e-lū-sá-tēn	lū-sa-í-tēn	lū-sa-í-st ^h ēn
1p	e-lŭ-sa-men	lŭ-sa-i-men	lū-sa-í-met ^h a
2p	e-lŭ-sa-te	lŭ-sa-i-te	lŭ-sa-i-st ^h e
3p	é-lū-sa-n	lŭ-se-i-an	lŭ-sa-i-nto

There is no reason to expect *-se* for *-sa* in any of these cases as part of the phonology. Rather, it appears that *-se* appears as the result of a Readjustment Rule that changes *-sa* when certain AGR nodes are present. The rule is highly specific to the 2s, 3s, and 3p aorist optatives; even more specific is the fact that it only applies in actives, and not in middles, as shown in the third column of (57c).

From the perspective of locality, this Readjustment Rule applies in configurations in which the triggering morpheme, the AGR head, is not adjacent to the aorist morpheme. In the aorist indicative, AGR and the aorist head are adjacent, but this is not the case in the forms of the aorist optative in (57b): the optative *-i* intervenes. Thus, the rule that readjusts *-sa* has to see elements that are not adjacent to *-sa*.

Some alternatives to the Readjustment Rule analysis are possible. For instance, reducing the *-se* versus *-sa* effect to VI is conceivable, but not entirely promising. For example, the optative morpheme could be spelled out by a special VI whose exponent has a mystery segment *-?* in the relevant contexts, *-?i*, which beats *-i* and causes the *-sa/se* alternation phonologically. The hypothesized */?/* component would trigger the *-sa/-se* alternation locally. However, there seems to be little to gain from this maneuver, in the sense that there are no other effects of the putative *-?* component.

Another possibility is to put *-se* in competition with default *-sa* as the exponent of the aorist head. In the Optative forms, the Aorist head would not be adjacent to the AGR node, so the only way to condition the *-sa/-se* alternation would be to make the *-se* sensitive to ϕ -features on T placed by AGREE. It is difficult to see how this could account for the active/middle contrast, however.

It appears that the most straightforward analysis of this effect changes *-sa* to *-se* via a Readjustment Rule, along the lines discussed above.

While Readjustment Rules do not appear to respect the linear condition that is found with contextual allomorphy, it is possible that Root-specific Readjustment Rules are subject to phase-determined conditions on *activity*, in the same way that contextual allomorphy is. These restrictions apply to those Readjustment Rules that have to make reference to the identity of a specific Root or morpheme in order to apply, such as the the Readjustment Rule that creates *sing* has to see $\sqrt{\text{SING}}$ in the structure $[[\sqrt{\text{SING}} v] T[\text{past}]]$. This type of rule has to see the identity of the Root in order to apply; it is not triggered by the phonological matrix alone. This property is similar to what is found with grammatically conditioned allomorphy, where particular Roots or morphemes are visible for contextual allomorphy. The expectation of theory of Chapter 2 is that the “activity” of elements should be the same, whether for contextual allomorphy or for Readjustment Rules; that is:

- (58) READJUSTMENT ACTIVITY HYPOTHESIS: A Readjustment Rule triggered by morpheme *X* can effect a Root- or morpheme-specific change only when *X* and the Root/functional head are in the same PF cycle.

According to this hypothesis, the cyclic conditions on what a Readjustment Rule could target are subject to \mathbb{C}_1 locality. Thus, non-cyclic heads outside of the first cyclic head could trigger Root-specific Readjustment Rules, but outer cyclic heads could not, and so on.

3.4.2 Sensitivity to Phonology

The first chapter of this book contains some initial illustrations of phonologically conditioned allomorphy (PCA). This is a type of suppletive allomorphy in which the factor that determines the choice of allomorphs is not a particular morpheme in the environment of the node being spelled out, but is instead some aspect of the local phonological representation. The passive morpheme in the language Seri, for example, has the forms in (59):

(59) Seri passive

Allomorph	Env.	Example	Gloss
-p-	/__V	-p-eši	‘be defeated’
-a:ʔ-	elsewhere	-a:ʔ-kašni	‘be bitten’

Whereas allomorphy in e.g. the English past tense makes reference to the identity of specific Roots, allomorphy of this passive morpheme [pass] makes reference only to a phonological property: whether the object next to [pass] begins with a vowel or a consonant.

In terms of the theory of Chapter 2, this kind of allomorphy is subject to \mathbb{C}_1 -LIN locality. In the case of (59), this means that there must be VIs in which the contextual condition refers to the phonology of the linearly adjacent element:

(60) VIs

[pass]	\leftrightarrow	-p-/__ \frown V-
[pass]	\leftrightarrow	-a:ʔ-

In this particular case, it is segmental material that is visible. In cases in which the suppletive allomorphy is determined by metrical structure, then the foot structure of the object next to the morpheme undergoing VI is visible (more precisely, perhaps, a foot boundary is visible).²²

In the way just described, the theory allows VI to see phonological representations. In the Seri example, the phonological property that conditions allomorphy is a property of the underlying representation of the Root. However, Vocabulary Insertion could in principle make reference to derived phonological structure as well. The details of this type of interaction depend on specific claims about when phonological cycles occur with respect to VI. That is, there are different possible models of when “inner” material is processed phonologically in the course of cyclic (inside out) VI. Questions of this type are familiar in phonological theory. An important question that arose following *The Sound Pattern of English* is the extent to which there is *Interactionism* between morphology and phonology. A strong form of Interactionism considered in different versions of Lexical Phonology and Morphology (see Hargus 1993 and Odden 1993) holds that morphological cycles can see the output of earlier phonological cycles. Not only can morphological processes be sensitive to phonological properties, but they may also detect *derived* phonological properties, as long as these occur in an earlier stratum (see Hargus 1993 for illustration).

While phase-cyclic derivation may force certain positions on phonological interaction—e.g., by specifying where spell out occurs—there are many aspects of the interface between morphology

and phonology that could be implemented in different ways that are all compatible with the theory of Chapter 2. Take, for example, in a structure that consists of a Root, a cyclic head x , and non-cyclic affixes Y and Z, $[[[\sqrt{\text{ROOT}} x] Y] Z]$. Aside from phonological cycles triggered by cyclic spell out, it is perhaps also the case that individual exponents trigger a cycle of phonological rule application (this is one take on part of Halle and Vergnaud’s (1987) analysis of “Level 1” versus “Level 2” affixes in English). To the extent that cycles of phonology are followed by VI, the theory then allows “interactionism”, in which VI at outer nodes is in principle capable of being conditioned by the *derived* phonology of inner pieces.

For the purposes of this book, the most important point is that while morphology (VI in particular) and phonology might be interleaved, they are distinct systems, so that output or subsequent phonology cannot drive VI. This point is discussed in detail in Part II below.

While the exact set of phonological details implicated in the discussion immediately above cannot be explored here, an important point about PCA is that allomorphic sensitivity to phonological representations is not bound in the same way that allomorphic sensitivity to a particular Root or morpheme is. The phonological representations of elements that are derivationally “closed off” by the ACTIVITY COROLLARY are visible for later stages of derivation. When a Root or a particular functional head is active, this means that it is visible *qua Root*, or as a functional head of that particular type. This means that for either morphophonological or semantic purposes, there could be Root- or morpheme-specific interactions during the derivational window in which these elements are active.

In later stages when these elements are closed off by the ACTIVITY COROLLARY, these elements cannot be seen as Roots or as particular functional heads. However, these elements possess a phonological matrix, and this representation may be visible to subsequent operations. For example, it is in principle possible for phonologically conditioned allomorphy at Outer nodes to make reference to a phonological matrix associated with a Root. A rule of this type could not, however, target certain Roots to the exclusion of others; it would have to apply to any phonological representation meeting the structural description of the rule.

Relatedly, elements that are *inactive* due to the cyclic structure nevertheless must enter new statements of linearization. When, for instance, a DP is merged into a larger syntactic structure as e.g. a subject, the rightmost element of that DP must ultimately be linearized with respect to elements that are outside of the DP cyclic domain. In other words, even though that particular element is *inactive*, it still has to enter some new PF relations that account for the order of elements.²³ What this means is that, in some sense, PF cyclic derivation cannot be completely “done” with elements that are *inactive*.

3.4.3 An Illustration: Palauan Verb Marker Allomorphy

The Austronesian language Palauan provides an interesting case study for the interaction of locally conditioned allomorphy with a complex morphophonology. An apparent counterexample to the adjacency-based view of allomorphy— a case where a morpheme sees a Root in spite of there being an *overt* intervening morpheme— turns out to be a case where the phonology obscures what is a local linear relationship when VI takes place. The case study thus illustrates the basic point that the generalizations about locality of allomorphic relations are clear in a theory in which morphology (VI) and phonology are separate systems.

The discussion here draws on Flora (1974) and Josephs (1975,1990). Palauan has a morpheme called a “Verb Marker” (VM) in the literature; it resembles morphemes found in many other Aus-

tronesian languages which relate to transitivity, voice, aspect, and related notions. This morpheme, whose basic form is *mə-*, shows up as a prefix (and also as an infix) in many verb forms, in a way correlated with (i) verbhood, and (ii) (in)transitivity. This suggests a treatment of this morpheme as a *v* or a Voice head.

Some initial examples of the VM are presented in (61), which shows two cases: instances where VM is realized as *mə-*, and a further set of cases where it surfaces as *o-*. The latter set of cases are all labial-initial Roots, and it appears that the VM undergoes dissimilation in these cases:

(61) VM-Verb

	Verb	Gloss
a.	<i>mə-rael</i>	‘walk, travel’
	<i>mə-ngədub</i>	‘swim’
	<i>mə-ləʔo</i>	‘bathe’
	<i>me-ʔiuaiu</i>	‘sleep’
<hr/>		
b.	<i>o-bəkall</i>	‘drive’
	<i>o-bail</i>	‘clothe’
	<i>o-boes</i>	‘shoot’
	<i>o-bes</i>	‘forget’

The phonological dissimilation seen in (61b) is not, however, the only source of surface /*o*/-realizations of the VM. For a small class of verbs, this morpheme appears as *o-*, even though the stem does not begin with a labial:

(62) Exceptional *o*-verbs (Josephs: 148)

<i>o-ker</i>	‘ask’
<i>o-klukl</i>	‘cough’
<i>o-koad</i>	‘fight’
<i>o-sus</i>	‘greet’
<i>o-ʔərʔur</i>	‘laugh’
<i>o-siik</i>	‘look for’
<i>o-kor</i>	‘refuse’
<i>o-kiu</i>	‘go by way of’

In these cases, it appears that the Roots in question condition the insertion of an underlying *o*-allomorph of VM; there is no way to derive the *o*- phonologically. This means that the language must have the following two Vocabulary Items:

- (63) VM ↔ *o*-/_ ◊ LIST
 VM ↔ *mə*-

When additional verb forms are taken into account, there is what appears to be a problem for the adjacency-based theory of allomorphy, as instantiated in the first VI in (63). In the past tense, an overt tense morpheme *-il* occurs in between the VM and the verb Root. Thus, using so-called “Middle” verb forms to factor out some morphophonological complications, we find patterns like the following:

(64) Past tense of *mə*- Verbs

Present	Past	Gloss
<i>mə</i> -nga	<i>m-il-ə</i> nga	‘eat’
<i>mə</i> -ngələbəd	<i>m-il-ə</i> ngələbəd	‘hit’
<i>mə</i> -lim	<i>m-il</i> -lim	‘drink’
<i>mə</i> -luʔəs	<i>m-il</i> -luʔəs	‘write’
<i>mə</i> -tabək	<i>m-il</i> -tabək	‘patch’

The same effect is found with those verbs that show an *o*- for the VM. In both types of *o*-verb—those where /*o*/ is underlyingly *mə*- (65a), and those in which there is an *o*- allomorph of VM (65b)—this /*o*/ is found when the *-il-* morpheme appears between the VM and the Root. I represent these cases with the sequence *o-il-Verb*:²⁴

(65) Examples

	Present	Past	Gloss
a.	<i>o</i> -baləʔ	<i>o-il</i> -baləʔ	‘shoot’
	<i>o</i> -basəʔ	<i>o-il</i> -basəʔ	‘count’
	<i>o</i> -bunt	<i>o-il</i> -bunt	‘curl’
	<i>o</i> -bes	<i>o-il</i> -bes	‘forget’
	<i>o</i> -mes	<i>o-il-ə</i> mes	‘see’
b.	<i>o</i> -siik	<i>o-il</i> -siik	‘look for’
	<i>o</i> -ker	<i>o-il-ə</i> ker	‘ask’
	<i>o</i> -kiu	<i>o-il-ə</i> kiu	‘go by way of’
	<i>o</i> -muʔəl	<i>o-il-ə</i> muʔəl	‘begin’

The surface order of the morphemes in these verbs is shown in (66):

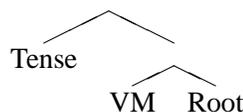
(66) Surface Form: VM-TNS-Root

Crucially, the VM and the Root are not adjacent in the surface form. If the linear part of the theory advanced above is correct, then the surface form cannot be the one that is relevant for the locality conditions on allomorphy. Rather, at the stage when VI occurs, the VM must be concatenated with the Root, so that it can have its allomorphy conditioned accordingly.

Closer examination of the morphophonology reveals that there is evidence for such a representation. The argument is that the *-il* past tense morpheme is infixes *phonologically* to whatever is on its right. This infixation takes place after VI has taken place.

The structure that underlies the past tense verbs is as follows, where VM is a *v*/Voice head structurally lower than T:

(67) Past Tense Verb



In the concatenation statements derived from this structure, the Root is adjacent to the VM, i.e., $VM \hat{\ } \text{Root}$. This statement is present when VI occurs, and the Root-determined allomorphs can be inserted when necessary. Subsequent to the VI process, the *-il* morpheme that realizes Tense is infixated in the phonology to yield the surface representations that are shown above:

(68) o-il-siik (ulsiik) ‘look for-PAST’

- a. Structure: [Tense [VM $\sqrt{\text{SIİK}}$]]
- b. PF
 - i. Concatenation: $\text{Tense} \hat{\ } VM, VM \hat{\ } \sqrt{\text{SIİK}}$
 - ii. Vocabulary Insertion: $[\text{Tense}, -il] \hat{\ } VM, [VM, o-] \hat{\ } \sqrt{\text{SIİK}}$
 - iii. Chaining: $-il-o-\sqrt{\text{SIİK}}$
 - iv. **Phon:** $o-il-\sqrt{\text{SIİK}}$

Evidence for this analysis comes in a few steps. First, it can be shown that past tense *-il* is infixated into whatever element is on its right. Thus, it does not originate between the VM and the Root. Second, the infixation is phonological in nature: it sees phonological entities (segments, etc.), and not morphosyntactic ones like the Subword. This means that it must take place after VI occurs.

There are different types of examples that illustrate the point that *-il* is an infix. One set of cases consists of verbs in the perfective aspect/tense. In the non-past perfective, the VM appears infixated into the root. In the past perfective, where the VM never surfaces, the past tense *-il* is infixated after the stem-initial consonant, as is expected if this element is infixated in the phonology:

(69) Perfective Forms

Stem	Perfective	Past Perfective	Gloss
dasəʔ	d-m-asəʔ	d-il-asəʔ	‘carve’
deel	d-m-eel	d-il-eel	‘nail’
kiis	k-m-iis	k-il-iis	‘dig’
leng	l-m-eng	l-il-eng	‘borrow’

A similar point can be made with some stative verbs that do not take a VM; with these verbs, the Past Tense *-il* appears infixated into the Root as well (70b); regular statives (70a), in which past *-il* follows VM, are provided for illustration:

(70) Some Statives

Stem	Past	Gloss	
a.	mə-kar	m-il-kar	‘be awake’
	me-ʔiuaiu	m-il-əʔiuaiu	‘sleep’
b.	dəngʔokl	d-il-əngʔokl	‘sit’
	kie	k-il-ie	‘live’

As seen in the (70a) type, the past tense marker surfaces after the VM, which makes it look like the morpheme order is VM-TNS-Verb; however, *-il-* also appears after Root-initial segments, as seen in (70b). This kind of infixation is not definable in terms of morphosyntactic nodes. Rather, it is the result of a phonological rule.

Putting these points together, the behavior of the “exceptional” class of verbs with the *o*-Verb Marker is not a counterexample to the adjacency-based view of allomorphy. In the representation where allomorphy is determined, the VM is concatenated with the Root, and can see it for allomorphic purposes. Subsequent action in the phonology infixes the past tense morpheme *-il*, but this is after the point that is relevant for Vocabulary Insertion.²⁵

The analysis of this effect illustrates many aspects of the Localist theory: both local relationships and different stages of a serial derivation play a crucial role. In particular, morphology (here, structural relations from the syntax, and VI) must be distinct from phonology. The important generalizations about allomorphic locality are, if this analysis is correct, not always found in surface forms. Rather, the phonology has the potential to obscure a relationship that is local when VI occurs. Making sense of patterns of this type in a way that retains a restrictive account of allomorphy requires a theory in which morphology and phonology are distinct, along the lines of what has been proposed above.

3.5 Conclusion to Part I

The core of chapters 2 and 3 develops the Localist theory of syntax and morphology, makes specific proposals about how cyclic derivation works, and articulates a theory of allomorphy which derives from the interaction of cyclic and linear factors. Taken on its own, this part of the book illustrates the strong predictions that are derived when a cyclic theory of derivations are pushed into morphology and phonology.

This work also provides a foundation for addressing the broader range of questions raised in Chapter 1, which highlight the different factors that Localist and Globalist theories allow to exert an influence on how phonological forms are derived. While the Localist theory of syntax and morphology does not, in the end, force a full-fledged phonological theory, it places sharp constraints on interactions of the type that are the focus of this monograph. It does this by making specific claims about the types of information that could play a role in the derivation of some object’s phonological form.

The details of the \mathbb{C}_1 -LIN theory are subject to investigation and (dis)confirmation. The overall picture that emerges from the next part of the book is that, even if this particular Localist theory is incorrect, morphology and phonology do not show the types of interactions that would require a Globalist architecture.

Part II: Phonologically Conditioned Allomorphy

Phonologically Conditioned Allomorphy: The Globalist Intuition

The first chapter of this book highlights the fundamental tension between Localist theories of the type developed in Part I of this book on the one hand, and the prevailing view in phonological theory, the Globalist framework of Optimality Theory, on the other. This part of the monograph compares the empirical predictions of these theories in the domain of (phonologically conditioned) allomorphy. This comparison, which relies on the specifics of allomorphic interaction, implicates a larger question: *how do morphology and phonology interact?*

In the current theoretical context, where syntactic theories of morphology have advanced considerably, the architectural scope of this question is quite broad. Questions about morphology and phonology implicate syntax as well; this point is emphasized in Embick and Marantz (2008), and recognized in some form in a number of theories that seek to account for putative competitions between words and phrases. Thus, what is at issue here goes well beyond morphology in the narrow sense: the general question is how the sound form of complex expressions relates to the system(s) responsible for generating such expressions.

A central focus of the following chapters is the question of whether there is evidence for any sort of global interaction between morphology and phonology. In the terms employed in Chapter 1, a theory that allows morphology and phonology to interact globally shows *Global-MP*. The primary result of Part II of this book is that even theories with a “limited” form of Globalism make predictions about allomorphy that are (i) distinct from those made by Localist theories; and (ii) importantly, not borne out by the data.

This line of argument is quite general. In many Globalist theories, some limitations on global interaction are assumed. Thus, for example, mission statements like those provided in McCarthy (2002) point to a “standard assumption” to the effect that phonological and syntactic computations are different in OT terms, which makes for a kind of limited modularity (see 2002:142 in particular). The same work, however, recognizes that arguments *for* OT’s architecture would be stronger to the extent that all such modular boundaries were found to be epiphenomenal. More recent moves in Globalist theories have been made in the opposite direction, towards cyclic or serial architectures. As discussed in Chapter 6, however, it appears that even the “restrained” Global-MP allowed in such theories makes incorrect predictions about allomorphy.

4.1 Phonology/Morphology Relations

The question of how morphology and phonology interact has a long history, one which pre-dates generative theories of language. To a large extent, research in the generative tradition has taken the position that morphology and phonology constitute separate systems of grammatical competence, with the important research question being the exact manner in which these components interact. Another important set of questions concerns putative “dividing lines” between these two domains:

e.g., can phonological rules be morphologically conditioned, and vice versa?

Answers to these questions rely crucially on assumptions about the nature of morphology, the nature of the morpheme, and so on. In Chomsky and Halle's (1968) *The Sound Pattern of English* (SPE), for example, morphological structure is built before phonological rules apply, so that phonological rules do not begin to interpret an internally-complex word until it has been completely built. In accordance with the principles of the transformational cycle, however, the phonological rules operate "inside out" on bracketed structures, in a way that makes the domains for phonological interaction isomorphic to the domains for morphological composition in the default case. In this theory, (i) morphology and phonology are distinct components of the grammar, and (ii) interaction between them is limited, in the sense that phonological rules can see morphological structure, but not vice versa: no morphological rule can see the output of any phonological rule, because all of the morphological rules apply to create such structures before the phonology begins to operate on them. It is for this reason that theories like that of SPE are sometimes called *Non-Interactionist*.

The particular form of Non-Interactionism that is found in SPE derives from specific assumptions about the nature of the morpheme, and the nature of the processes that assemble morphemes into complex objects (labelled bracketings). Stepping back from the details of this particular approach, it is clear that in general, there are two questions about morphology that different theories account for in different ways:

- (1) Two parts of morphology
 - a. *Combinatorics*: What is the nature of the system that assembles morphemes into complex objects?
 - b. *Allomorph Selection*: What is the nature of the system that provides morphemes with their phonological form?

In SPE, it is assumed that "morphological rules" combine morphemes into labelled bracketings, answering the first question. For the second question, it is assumed that the morphemes that are combined by morphological rules possess a phonological underlying representation. In this theory, then, the fact that phonology cannot "feed" morphology derives from the fact that both aspects of (1) are determined before the phonological rule system begins to apply.

Some theories that follow SPE deviate from this view of phonology and morphology by allowing interactions in which morphological rules follow phonological rules. So, to take the most salient example, Lexical Phonology (Pesetsky 1979, Kiparsky 1982 and related work) proposes that cycles of morphology and phonology are interleaved in a way that allows for morphology to see the output of phonology under some circumstances, not just vice versa; this is an *Interactionist* position. Whether the general rule is that each morpheme triggers a cycle of phonological rule application, or that sets of morphemes are followed by phonological cycles (*stratal* organization), the general principle is the same: morphological operations that build structure and introduce the phonological underlying representations of morphemes are interleaved with phonological rules.

The theory presented in Part I, in which syntactic structures are built and then operated on in the PF component, allows certain interactions between morphology and phonology, and not others. It answers the question in (1a) by holding that morphemes are composed in syntactic structures. The functional morphemes that appear in such structures do not have a phonological representation underlyingly. Rather, this information is provided in the process of Vocabulary Insertion. Thus while (1a) occurs before the phonology, it is possible for (1b), the Vocabulary Insertion process, to be

sensitive to the earlier application of phonological rules (some different possibilities along these lines are outlined in Chapter 3).

Structurally, the theory of Part I allows for Vocabulary Insertion to make reference to local phonological properties of elements that are inside of the node being worked on. Overall, however, the types of interaction that are allowed are quite restricted in scope. While there might be phonological sensitivities encoded in the contextual conditions on Vocabulary Insertion, this process is locally encapsulated, and operates without reference to subsequent actions of the phonological component, which in turn must deal with whatever VI serves up to it. In short, the theory allows (limited) phonological sensitivity in allomorphy, but it allows no outright selection of allomorphs by the global or surface phonology.

The restricted type of phonological sensitivity that is possible in a Localist theory contrasts sharply with what is allowed in a theory with a globally interacting morphology and phonology (Global-MP). Global-MP offers one of the most extreme types of Interactionism that can be formulated: not only can morphology see the output of earlier cycles of phonology; morphology and phonology are one system, such that any aspect of the phonology of an entire derived word could in principle affect the shape of a morpheme anywhere in that word. While specific theoretical proposals in the OT context might restrain possible interactions in different ways, the framework allows in principle any aspect of the (output) phonological representation to *determine* either the *Combinatorics* (1a) or *Allomorph Selection* (1b). To the extent that the *Combinatorics* are done by the syntax—as argued for in Distributed Morphology and related approaches—this means that there would be a globally interacting syntax, morphology, and phonology, in which phonological well-formedness of surface forms could conceivably play a decisive role in many competitions. The prospects for this kind of approach to morphosyntax, however, seem rather poor; see Embick and Marantz 2008 for discussion. The question that is addressed below is whether there is any evidence for Globalism in phenomena which are more morphophonological in nature, where allomorphy provides the crucial information.

4.2 Allomorphy and Globalism

In the domain of allomorphy, a sort of best case scenario for Globalism—i.e., one that would be a strong argument that the grammar has to be organized in those terms—would be one in which all allomorphic selection in a language could be predicted on the basis of the constraint system that is required for the “normal” phonology of the language in question. In this hypothetical universe, the grammar generates all host allomorph combinations and variations on these, and the winners (i.e. the correct allomorphs) are selected via the phonology.

This kind of intuition is found in a qualified form in the $P \gg M$ theory of McCarthy and Prince (1993b), which hypothesizes that in certain types of interactions, phonological constraints must trump morphological constraints. The role played by this ranking schema is seen clearly in the analysis of infixation, where, for example, prosodic constraints that require an affix to adjoin to a prosodic unit like the foot outrank “morphological” constraints that make that affix either a prefix or a suffix.¹

The $P \gg M$ theory is restricted, so that phonology is predicted to trump morphology with “prosodic morphology”; in cases of “normal” affixation, morphological constraints may prevail. However the restriction to prosodic morphology is to be defined, the Globalism that is central to OT predicts that there should be many cases in which the effects of $P \gg M$ are visible. Phonologically Conditioned

Allomorphy (PCA) in particular is predicted by the P≫M approach to be defined by phonological surface well-formedness. It is thus expected to be phonologically optimizing.

The P≫M theory makes other predictions as well, although these are of limited interest to the current discussion. A wide range of phenomena covered by P≫M have been examined elsewhere in the recent literature; Paster (2006) and Bye (2008), in particular, have argued that the empirical predictions of this theory are not borne out. While these arguments appear to be sound, it must be stressed that P≫M is only one specific theory that can be formulated within a Globalist framework. There are many, many predictions that derive from Globalism that do not require the details of P≫M, but which would be impossible to state on a Localist view. The comparison between Localist and Globalist theories that is executed below assumes this more general orientation, and looks for any type of interaction that could provide empirical evidence for Global interaction between morphology and phonology, in any form.

4.2.1 Phonologically Conditioned Allomorphy: The Globalist Intuition

The predictions for allomorphy that derive from a theory with Global-MP can be approached in a few steps. Starting at the most general level, it is clear that phonology cannot play a role in *all* cases of allomorph selection. There is no reason to think, in particular, that phonological considerations should play a role in *grammatically* conditioned allomorphy. Thus, for example, the “regular” phonology of English is not the reason why Vocabulary Insertion selects the the exponent *-t* for the past tense of *bend*, but *-ed* for the past tense of *mend*.² This is a “morphological” fact, one that, from the perspective of almost any grammatical theory, simply has to be memorized. This is the reason that McCarthy and Prince restrict P≫M to cases of prosodic morphology; in grammatically conditioned allomorphy, morphological constraints can dominate phonological ones, such that the phonological constraints do not play a role in determining allomorph choice (cf. McCarthy and Prince 1993, ch.7).

For obvious reasons, the clearest differences between the predictions of Localist and Globalist architectures are seen in PCA. While the details of the predictions are important, and will be fleshed out in the rest of this book, a basic prediction of a theory with even restrained Global-MP is that at least some cases of allomorphy should be determined by global interactions in a complex word: interactions in which surface phonology plays the decisive role.

While the emphasis of the next two chapters is on empirical predictions of the type just mentioned, there are many comparisons of Localism and Globalism in the literature that operate on a conceptual level, and these must be acknowledged before the discussion proceeds.

On the conceptual front, Globalist theories are committed to the idea that patterns of allomorph selection in PCA are the way they are *for a reason*, and that this reason must be stated in the grammar. In other words, a bare statement of the distribution of allomorphs is not enough: the grammar must explain distributions in phonological terms. This kind of argument is typically put forth with reference to cases of PCA that appear to “make sense” phonologically. Recall, for example, the Korean nominative morpheme, whose allomorphic distribution in terms of C-final and V-final hosts could be understood in terms of syllable-structure markedness:

(2) Korean Nominative

-i after C: pap-i ‘cooked rice’

-ka after V: ai-ka ‘child’

While any theory can acknowledge that some non-trivial phonological patterns might be found in allomorph distribution, the conceptual part of the Globalist program goes beyond this: it asserts that the grammar itself must say why this distribution is found. Stating “why” a distribution is found in this way is something that requires Global-MP, because it is only in such a theory that output phonology of the whole word could determine morphology.

Thus, the driving intuition behind the Globalist research program in this domain is that (at least some) allomorph distributions are the way they are because the phonology plays the decisive role in allomorph selection. The further argument is that Localist theories, even if they are capable of stating the distribution, are missing something essential, because such theories cannot say that the output phonology is what is responsible for that distribution.

4.2.2 Illustration and Implementation

Schematically, an approach that implements allomorph selection in terms of output properties needs two components in order to function properly. First, for any given HOST and allomorphs x_1 , x_2 , etc. of some morpheme, the grammar must generate all possible combinations (3a); these are in competition. Then, some set of principles must determine which combination is the winner of the competition, such that the rest are marked as ungrammatical:

(3) Schematization

$$\text{a. GENERATION: HOST, } \left\{ \begin{array}{l} x_1 \\ x_2 \\ x_3 \end{array} \right\} \rightarrow \text{HOST-}x_1, \text{HOST-}x_2, \text{HOST-}x_3$$

b. SELECTION: pick winner, mark losers as ungrammatical

Clearly, the idea behind implementing allomorph selection in this way is that the constraints of the (normal) phonology are decisive in the SELECTION stage (3b). As should be clear from (3), one way of making the overall picture precise in OT terms is to have (3a) performed by GEN, and (3b) performed by EVAL.

The line of reasoning embodied in (3) is exploited in several early works on PCA. To take a specific example, another case of allomorphy from Korean that has been analyzed in this literature illustrates some important points about how the phonology could be employed to drive allomorph selection. The allomorphy is exhibited by the “topic/focus” morpheme, which appears with the allomorph *-un* after C-final hosts, and *-nun* after V-final hosts:

(4) Korean *Topic/Focus* morpheme

-un after C: pap-un ‘cooked rice’

-nun after V: ai-nun ‘child’

As noted by Lapointe (1999) and others, the type of C/-Ø alternation shown by this morpheme appears to fall out naturally in a theory with the properties of (3). A generalized (and weakened) version of this type of reasoning is taken up in Bonet et al. (2007) and Mascaró (2007); these papers analyze the data in (4) along the lines of (5):

(5) Analysis of allomorph selection

pap-{-un,-nun}	ONSET	NoCODA
☞ pap-un		*
pap-nun		**!
ai-{-un,-nun}		
ai-un	**!	*
☞ ai-nun	*	*

The idea is that a candidate like **pap-nun* violates NoCODA more than *pap-un*, and **ai-un* violates ONSET more than *ai-nun*. In this way, the distribution of allomorphs is exhaustively determined by constraints with independent motivation. Moreover, the constraints are phonological (highlighting the idea that morphology and phonology are one system, as supposed by Global-MP), and they are those associated with familiar patterns in syllable structure (highlighting the idea that selection of allomorphs is driven by optimization of the output phonology).³

4.2.3 Generalizing: Phonological Selection

I refer to theories in which Globalism allows global properties of the phonology (or the surface phonology) to determine allomorph selection as implementing *Phonological Selection*. Along with the general idea that there are instances where some aspect of the phonology determines allomorph selection in this way, there is a strong version of this hypothesis according to which all (phonologically conditioned) allomorph selection is determined by the normal phonology:

(6) Types of Phonological Selection

- a. *Phonological Selection*: The constraints responsible for the (normal?) phonology play at least some role in determining allomorph selection in a way that requires reference to global properties (or properties of surface outputs).
- b. *Strong Phonological Selection*: In cases of PCA, the choice among competing allomorphs is determined exclusively by the normal phonology.

In Chapter 3 of this book, it was shown that the \mathbb{C}_1 -LIN theory allows phonological information to be a contextual condition on Vocabulary Insertion. However, in this theory only the phonology of “inner” nodes that could potentially be visible to a node undergoing insertion. The effects of *Phonological Selection* schematized in (6) go far beyond this, by allowing the phonology of outer morphemes or the phonology of the entire word to determine which allomorph is chosen. This point of contrast— along with some others— allow the predictions of Localist and Globalist theories to be compared directly.

As is discussed in the next chapter, *Strong Phonological Selection* does not work, and this has driven various Globalist theories to introduce different kinds of morphological ordering into the analysis of PCA. Since evidence for *Phonological Selection* in any form would be an argument for the Globalist view, the empirical focus in the next chapters is on the status of (6a).

4.3 Generalizations and Formal Predictions

The next two chapters examine the intuition behind *Phonological Selection*, and the formal predictions made by theories with Global-MP. Before moving on to this part of the discussion, which concentrates on specific empirical expectations and predictions, some further further clarifications

are in order concerning *conceptual* motivations for Global-MP and *Phonological Selection*, expanding the introductory remarks in 4.2.1.

The conceptual points can be illustrated with reference to the C_1 -LIN theory of Part I. Recall that in this theory, cases of PCA are analyzed by means of VIs that make reference to phonological properties of adjacent objects. So, for example, the allomorphy shown by the Korean topic/focus morpheme could be analyzed as follows:⁴

- (7) [top/foc] \leftrightarrow -un/C[^]__
 [top/foc] \leftrightarrow -nun/V[^]__

The question raised in comparison with Globalist frameworks is this: is a Localist approach along the lines of (7) missing a generalization in exactly those cases where the allomorphy is apparently “optimizing”, because it does not assert that the allomorphs are distributed the way they are for this reason? Clearly, the Vocabulary Items in (7) account for the distribution of the exponents, but they do not say *why* this pattern is found; is this enough? A familiar claim in the debate between Globalist and Localist theories in phonology is that the latter type of theory is explanatorily inadequate because it does not explain why certain patterns are found, and not others. With reference to something like (7), the idea is that the Localist theory is explanatorily deficient because it can say nothing about the fact that the distribution is non-arbitrary when viewed in terms of properties of the output forms.

The idea that Localist theories have nothing to say about patterns of distribution is, however, misleading. A more accurate way of making the point is that the Localist theory cannot state *within the grammar* that the distribution of allomorphs is the way it is *because* surface phonological properties are optimized. There is an important point here that is often overlooked. It is not true that a Localist theory cannot be connected with any explanation of allomorph distributions; it can. However, it would assign the explanation of the putative generalizations about distribution to another part of the theory of language in the broad sense; after all, not every generalization about language is a generalization about the grammar. The net result of this line of reasoning is that the Localist view does not assert that there are *no* generalizations about how allomorphs are distributed in surface forms; rather, it holds that if there is something to be said about why some distributions (and not others) are found, these generalizations fall under the purview of diachrony, acquisition, phonetics, processing, etc., in some combination perhaps. Analyzing a generalization in these terms—i.e., assigning it to a system that is not the grammar in the narrow sense—does not exclude it from principled explanation.

From the Globalist point of view, the failure to account for distributions and the reason for there being particular distributions using the same mechanism (i.e., the grammar) is a shortcoming of Localist theories. Most theories of allomorphy that assume a Globalist framework begin with this point; McCarthy offers a clear version of what is at stake:

Derivational approaches based on selecting an allomorph at the point of lexical insertion miss the connection between the constraint(s) responsible for allomorph choice and the constraints of phonology as a whole. (2002:154-5)

That is, a Localist theory in which allomorph selection does not make reference to global or output properties cannot connect patterns of allomorph distribution with (independently motivated) aspects of the phonology of the language.

This particular version of the argument takes for granted a view in which PCA results from the “normal” phonology alone, something which was shown not to work in early research on this topic (see Chapter 5). Nevertheless, the line of argumentation is clear, and could be deployed even if *Strong Phonological Selection* does not hold: in short, on the Globalist view, stating distributions is not enough; what is needed is a statement *within the grammar* of why allomorphs appear where they do.

Conceptual arguments of this type figure prominently in the literature, and for or convenience, I refer to this class of arguments as being centered on *Putative Loss of Generalization*:

- (8) PUTATIVE LOSS OF GENERALIZATION (PLG): Localist theories are inadequate because in the cases in which allomorph selection optimizes the output according to some metric, the allomorph selection procedure does not explicitly state the fact that the distribution is driven by global or output properties of the phonology.

Discussion of PLG outside of the domain of allomorphy– i.e., in the domain of phonology proper– is extensive, where it is quite charged. Arguments at this level of abstraction are notoriously difficult to assess; they often implicate different and conflicting “research intuitions” about what explanations should look like and where they should be sought, rather than commensurable accounts that make different empirical predictions. To see exactly what role PLG plays in motivating Globalism over Localism, consider two types of effects:

- (C1) Cases in which the Localist theory is able to state the relevant distribution of allomorphs, but not why (in the PLG-relevant sense) this distribution is found.
- (C2) Cases in which the Localist theory is not capable of accounting for the relevant distribution of allomorphs, because the distributional facts themselves require Global-MP.

In cases of (C1), PLG is the only objection that can be raised against the Localist view. The goal of the following chapters is to put conceptual arguments to the side, and look at empirical arguments, which are centered on (C2). The hypothetical cases under (C2) go beyond PLG; they are, by hypothesis, simply not derivable in a Localist theory (not without missing the key generalization about distribution, in any case).

4.4 Outline

The argument of the following two chapters is straightforward. A theory with the capacity to “explain” distributions in the way described above must have certain formal properties. The formal predictions of this type of theory go beyond what can be expressed by an Localist theory. Even in cyclic or serial versions of Optimality theory, as long as more than a few morphemes are worked on in the same computational domain, the predictions about what could drive allomorphy are significantly different from what is allowed in a Localist view. Theories that have even limited Global-MP, and which thus allow PLG-compatible *explanations* of (C1), predict (C2) effects as an architectural consequence. However, there seems to be no evidence for global interactions of the (C2) type. The conclusion that I draw from this is that the Globalist architecture for morphology and phonology fails in its empirical predictions.

The argument goes in two steps. Chapter 5 looks at *Phonological Selection*, and examines the intuition behind it. It is shown that the motivation for *Phonological Selection* is weakened considerably when artificially restricted examples are replaced by complex systems of actual allomorphy. At a minimum, this means that Globalist theories do not generalize empirically; a further point is that there are cases in which such theories, because of their focus on surface effects, actually miss important morphophonological generalizations. Chapter 6 moves beyond the intuition and its conceptual motivations to the specific empirical predictions that Globalism makes for allomorphic interactions, and shows that in cases where Localist and Globalist views make different predictions, the Localist predictions are correct, and there is no evidence for Global interaction.

On the Intuition behind *Phonological Selection*

Chapter 4 outlines the intuition that Globalism extends to PCA. As noted there, the strongest confirmation that this intuition is correct would be found if all cases of PCA could be analyzed with the constraint system required for the normal phonology of a language.

There are many arguments in the literature showing that this view—*Strong Phonological Selection*—is incorrect. Some illustrations of this point are given below in §5.1. It must be stressed, though, that the failure of Strong Phonological Selection does not mean that the Globalist architecture as a whole makes incorrect predictions about morphology/phonology interactions. Rather, the most that can be concluded is that one particular type of theory that can be formulated within the broad confines of a Globalist architecture does not work. This conclusion leaves open the possibility that Phonological Selection is required in some weaker form; as noted in the last chapter, *any* clear empirical evidence for Phonological Selection would be an argument in favor of Globalism and against Localism.

Finding empirical arguments in which the strong predictions of Globalism are identified and tested is difficult. One reason for this is that Globalist theories that have detected the failure of Strong Phonological Selection have primarily attempted to account for the distribution of phonologically conditioned allomorphs by combining phonological constraints with different types of morphological ordering. These theories do not provide empirical arguments that the predictions of the Globalist framework are superior to those stemming from Localism; rather, they are fixes to a particular kind of Globalist theory, not arguments in favor of that architecture.

As a way of sharpening the empirical issues that are at stake, this chapter examines and evaluates the *intuition* behind Phonological Selection. This is the intuition that, in some form or other, surface or non-local phonological factors can play a decisive role in determining allomorph selection of any morpheme in a word. The main thrust of the argument is that when an analysis in these terms moves beyond limited examples, the intuition that underlies Phonological Selection is misguided, or at least misleading. It is possible in almost any language with PCA to find at least some cases in which it looks like Phonological Selection is operative, as long as attention is restricted to a subpart of the morphology. However, when systems of PCA are examined in more detail, the questions that come up center on the interaction of stored information about morphemes with the generative process. It appears that while the morphological operation of Vocabulary Insertion and the (morpho)phonological processes that affect morphemes when they are combined are central to this picture, non-local phonological factors are not relevant. The cases that make Phonological Selection look promising must be selected on an ad hoc basis, and the analyses of these subpatterns do not generalize.

The argument takes two forms. In §5.3, an analysis of the language Djabugay shows how *prima facie* simple explanations of allomorphy based on Phonological Selection do not generalize, and that the generalizations about case allomorphy found in this language do not implicate properties of output forms in a systematic way. The second part of the argument in §5.4 puts forth an analysis of

Yidij case allomorphy that extends the conclusions from §5.3, and makes a further point: important generalizations about the relationship between allomorph selection and vowel-length are obscured in a surface-based analysis in which phonology and morphology interact globally, but can be accounted for directly in a Localist framework in which morphology and phonology are distinct.

The points raised in this chapter are not direct arguments against the predictions of Globalist models in the strict sense. Rather, the conclusions are that (i) analyses based on Global-MP do not seem to generalize; (ii) the factors that must be taken into account in the analysis of systems of allomorphy are not those that are expected if Phonological Selection is part of the grammar; and (iii) analyses based only on properties of the output forms might in fact be missing some key generalizations that are stated transparently in a Localist model.

Taken together, these points raise serious doubts about the intuition that global phonological properties play an important role in allomorph selection. The next step in the argument, where formal predictions of Globalism and Localism are compared directly, makes up the substance of Chapter 6.

5.1 Phonological Selection and Ordering Allomorphs

Strong Phonological Selection does not work. What this means is that simple phonological constraints operating on all possible host-allomorph combinations do not always make correct predictions about the selection of phonologically conditioned allomorphs. This point is evident in at least two types of cases. In one class, there is phonological determination of allomorphy, but the resulting patterns are unexpected from the perspective of basic phonological constraints; this is illustrated with Haitian Creole determiner allomorphy in section 5.1.1. Another type of case involves phonological conditioning in which, for at least some hosts, basic phonological constraints are indifferent to the various allomorphic choices, because no constraints are violated by any of them. In such a case, the phonology by itself is unable to select a winner, and additional “morphological” constraints must be appealed to in order to account for the attested patterns. This is illustrated for genitive case affixes in the language Djabugay in 5.1.2.

While cases of this type are arguments against Strong Phonological Selection, they nevertheless can be analyzed in a Globalist theory. Importantly, though, none of the “fixes” to Strong Phonological Selection considered in the literature offer any evidence in favor of Globalism, as discussed in 5.1.3.

5.1.1 Haitian Creole Determiner Allomorphy

The allomorphy of a morpheme referred to as a “definite determiner” in Haitian Creole (see Klein 2003, Paster 2006, Bye 2008, Bonet et al. 2007) shows *-a* and *-la* allomorphs in a phonologically determined pattern.¹ The distribution is odd from the perspective of basic syllable structure markedness constraints. The *-a* allomorph appears after V-final hosts, whereas *-la* surfaces with those that are C-final:

- (1) a. *-a* after V

Noun	Noun-Def	Gloss
tu	tu-a	‘hole’
papje	papje-a	‘paper’
papa	papa-a	‘father’
lapli	lapli-a	‘rain’
chē	chē-ã	‘dog’

b. *-la* after C

Noun	Noun-Def	Gloss
liv	liv-la	‘book’
pitit	pitit-la	‘child’
ãj	ãj-la	‘angel’
kay	kay-la	‘house’

This distribution creates both VV hiatus (1a) and codas (1b). The reverse of the attested pattern does the opposite; i.e., if the *-la* allomorph appeared after vowel-final nouns, and the *-a* one after consonant-final nouns, this distribution would look like a clear case of phonological optimization, like, for example, the Korean examples discussed in Chapter 4.

A “simple” sort of fix for the Phonological Selection approach to allomorphy could be formulated if the phonology of Haitian Creole treated the patterns in (1) as optimal, for reasons that are not obvious until the phonology of the language as a whole is considered, but this seems rather unpromising. It is not the case that onsets are somehow disesteemed in this language. This is evident from the fact that there is epenthesis with [+ATR] vowels in front of the definite *-a*.²

(2) *Glide Insertion* after [+ATR] final vowels

- a. papje[j]-a ‘the paper’
- bato[w]-a ‘the boat’
- lapli[j]-a ‘the rain’
- tu[w]-a ‘the hole’
- b. papa-a ‘the father’
- bɔkɔ-a ‘the sorcerer’

The problems for Strong Phonological Selection are fairly clear. As noted by Paster (2006) and Bye (2008), which concentrate on the predictions of the P≫M theory of McCarthy and Prince 1993b, if both *-a* and *-la* affixed forms were potential candidates, then the phonology should select *-la* for V-final nouns; the language even epenthesizes in some cases, and clearly inserting *-la* in the first place would remove the need for this.³

From the perspective of a theory that maintains Phonological Selection in a weakened form, it is in cases of the Haitian Creole type that *morphological* ordering of some sort is most motivated, even if, as will be shown below, the need to order allomorphs morphologically arises in simpler cases (where allomorph distribution is not “perverse”) as well. Considerations of this type are framed in Bonet et al. 2007, where it is proposed that *allomorphic ordering* (developed as well in Mascaró 2007) establishes a partial order on the allomorphs of a particular morpheme, and a constraint called PRIORITY is violated by candidates that contain a non-prioritized allomorph.

The specific analysis of Haitian Creole proposed by Bonet et al. 2007 is that the grammar contains a Vocabulary Item for the definite determiner morpheme D[def] which contains a set of exponents. These exponents are ordered by the relation $>$, which establishes the priority relation among the allomorphs in the set:

$$(3) \text{ D[def]} \leftrightarrow \{a > la\}$$

A form that has *-la* instead of *-a* violates the constraint PRIORITY. This has to be a “morphological” effect in the sense that there is no reason why *-a* should be better than *-la* for phonological reasons alone.

The challenge for theories implementing Phonological Selection is to make at least part of the definite determiner’s distribution phonological. Since *-a* always beats *-la* on morphological grounds, other phonological constraints ranked higher than PRIORITY have to eliminate candidates with *-a* with C-final hosts. Bonet et al. 2007 posit the following constraints to achieve this effect:

(4) Additional Constraints

- a. R-ALIGN STEM SYLLABLE: Align right edge of stem $s]$ with right edge of syllable $\sigma]$
- b. *C.V: Avoid a syllable ending in a consonant followed by a syllable starting with a vowel.

The first constraint penalizes resyllabification of stem material, and the second penalizes the syllable contact that arises from the failure to resyllabify. Looking ahead, these constraints conspire to rule out *-a* with C-final hosts, since either resyllabifying or not incurs a violation of one of the constraints in (4).

The analysis with the constraints in (4) and PRIORITY is shown in the following tableaux (simplified slightly):

(5) Illustration

- a. *-a* after V

papa- $\{a > la\}$	R-ALIGN	*C.V	PRIORITY
papa.la			*!
☞papa.a			

- b. *-la* after C

liv- $\{a > la\}$	R-ALIGN	*C.V	PRIORITY
☞liv.la			*
liv.a		*!	
li.va	*!		

Since the constraints ranked above PRIORITY are phonological in nature, and are meant to enforce Phonological Selection, it is worth reflecting for a moment on how this analysis achieves what it does. When *-a* appears, it is because it is prioritized morphologically; it does not win out over *-la* on phonological grounds. When *-la* appears, it is because *-a* creates phonological problems, i.e., the *-a* form violates one of the constraints in (4). This analysis works mechanically because, as

noted above, the two constraints that are ranked higher than PRIORITY have the effect of making the preferred allomorph *-a* bad in C-final environments, whether it resyllabifies (R-ALIGN) or does not (*C.V).

This is (in part) a “phonological” solution, but, as far as such solutions go, it is highly specific to the case at hand. Since the shape of the dispreferred allomorph *-la* renders R-ALIGN and *C.V irrelevant, candidates with this allomorph win with C-final stems. These two constraints are irrelevant in other competitions as well. Other morphemes in the language trigger resyllabification with C-final stems, and steps must be taken in the phonological analysis to ensure that R-ALIGN and *C.V do the work they are supposed to do with *-la* while at the same time not ruling out resyllabification across the board (see the paper cited for details).

The net effect of these different facets of the analysis is clear: the two “phonological” constraints ranked higher than PRIORITY that force *-a* to lose do the relevant work in competitions with definite *-a* and *-la*. But, evidently, the *only* work done by these constraints is that they conspire to rule out *-a* with C-final stems; i.e., this solution is totally ad hoc.⁴

Taken as a whole, the analysis is one in which (i) there must be a stipulated ordering, one that is not in any obvious sense less stipulative than ordering VIs; and (ii) the role attributed to phonological selection involves constraints that are relevant only in accounting for the distribution of *-a* versus *-la*. These results are unimpressive; this kind of analysis is not superior in any obvious way to an account that simply achieves the distribution in purely “morphological” terms (e.g. ordering of VIs). Phonological Selection is maintained in practice, but in a way that strips the intuition behind it of most of its content.

5.1.2 Djabugay Genitives

The position that surface prosodic optimization (partially) determines allomorphic selection has been illustrated by Kager (1996) and others with reference to genitive case allomorphy in Djabugay, a language of the Cape York region of Australia (see Hale 1976a,c, Patz 1991). This case study appears at the beginning of Kager 1996, where it is adduced as an initial illustration of Phonological Selection’s appeal and prospects. In a way that connects with the PRIORITY theories examined above, Kager’s analysis recognizes that the phonology does not, by itself, suffice to predict the distribution of allomorphs correctly, so that there is a role for interaction with “morphological” constraints.

The set of facts considered in the works cited above is rather restricted in scope. Djabugay has two genitive affixes: *-:n* after vowel-final stems, and *-ŋun* with consonant final stems:⁵

(6) Genitive allomorphy

	ABS	GEN	Gloss
V-Final	guludu	guludu-:n	‘dove’
	gurra:	gurra:-n	‘dog’
C-Final	gaŋal	gaŋal-ŋun	‘goanna’
	girrgirr	girrgirr-ŋun	‘bush canary’

On Kager’s analysis, the phonological force that determines (part of) this distribution is exerted by a constraint that bans complex codas.⁶ The inputs to the competition consist of a noun and some abstractly specified suffix like GEN for the genitive, and the competitors have the distinct allomorphs of that morpheme. The phonology prevents *-:n* from attaching to C-final hosts by

*COMPLEX CODA (CC), which makes the *-ŋun* affixed form the winner. However, if this constraint were the only active force in allomorph selection, the grammar would not be able to rule out *-ŋun* for vowel-final stems, since neither e.g. *guludu:-n* nor *guludu-ŋun* violate that constraint. Thus Kager posits an additional constraint, GENITIVE=/n/, that is violated when the genitive allomorph is not *:-n*. This analysis is shown in (7):

(7) Competition between allomorphs

(i)	{ <i>gaŋal</i> -GEN }	*CC	GENITIVE=/n/
a.	☞ <i>gaŋal-ŋun</i>		*
b.	<i>gaŋal:-n</i>	*!	
(ii)	{ <i>guludu</i> -GEN }	*CC	GENITIVE=/n/
a.	<i>guludu-ŋun</i>		*!
b.	☞ <i>guludu:-n</i>		

The function of GENITIVE=/n/ is to establish a preference that prevents the *-ŋun* allomorph from winning across the board. In effect, it limits this “dispreferred” allomorph to environments where the preferred allomorph *:-n* violates the higher-ranking phonological constraint *CC. The affinities that this analysis has with the PRIORITY-type theory are clear.

Given the crucial role played by GENITIVE=/n/, it is important to consider how Kager’s analysis might generalize, restricting attention for the moment to Djabugay. One obvious question concerns the specificity of this constraint. In response to the desideratum that constraints be universal and the fact that a constraint like GENITIVE=/n/ cannot have this property, Kager proposes that this constraint is “quite plausibly” an instantiation of the universal constraint that shorter things are to be preferred to longer ones. Thus, according to this hypothesis, the ordering effect derives from a kind of economy consideration, one that has analogues in other domains.⁷

The Djabugay genitive is revisited in Mascaró 2007, where, beyond just looking at *:-n* and *-ŋun*, the additional roles of epenthesis and deletion are considered. Mascaró notes that in order to rule out “fixes” to the syllable structure effected by the insertion or deletion of material, MAX and DEP must be ranked higher than PRIORITY, which operates with the ordering {*:-n*>*-ŋun*}:

(8) Mascaró’s Analysis

(i)	<i>gaŋal</i> -{ <i>:n</i> > <i>ŋun</i> }	*CC	MAX,DEP	PRIORITY
a.	☞ <i>gaŋal-ŋun</i>			*
b.	<i>gaŋal:-n</i>	*!		
c.	<i>gaŋal-na</i>		*!	
(ii)	<i>guludu</i> -{ <i>n</i> > <i>ŋun</i> }	*CC	MAX,DEP	PRIORITY
a.	☞ <i>guludu:-n</i>			
b.	<i>guludu-ŋun</i>			*!

The *-na* candidate has *-n* and epenthesis; it does not violate the condition on codas, and thus has to be eliminated by other means, since it involves the prioritized allomorph. This is the role that is played by DEP.

The two analyses above are part phonological, part morphological. By allowing phonological and morphological constraints to interact in a single tableau, they are clear instantiations of theories

with Phonological Selection. A natural question to ask is to what extent the constraints posited for the analysis of the genitive extend into the rest of the Djabugay case system, where numerous additional instances of phonologically conditioned allomorphy are found. This question is addressed in 5.2.

For the moment, the treatments in (7) and (8) illustrate the same kind of point made above in the discussion of Haitian Creole. Even in “simple” cases of phonologically conditioned allomorphy, phonological constraints alone do not seem to determine the entire distribution of allomorphs; morphological constraints are needed as well.

5.1.3 Interim Assessment

The conclusions that can be drawn from the findings summarized in this section are relatively limited in scope. One conclusion is that Strong Phonological Selection— perhaps also the version of this called $P \gg M$ in McCarthy and Prince 1993— makes incorrect predictions; this is the main thrust of e.g. Paster’s (2006) critique. However, as noted at various points above, Strong Phonological Selection is one type of theory within the Globalist framework, and the fact that it makes incorrect predictions does not rule out other theories framed in the context of Globalist assumptions.

Beyond this, the specific fix made to the Globalist theories presented above— i.e., ordering of affixes— offers little of interest on its own. There is little reason to dwell on the details of the “hybrid” ordering theories, since there is no empirical argument that this type of approach is superior to a Localist theory.

A more productive question, which can be raised with reference to Djabugay genitive allomorphy above, is whether the analyses that employ Phonological Selection in some form are able to generalize to other cases of PCA in the same language. The concern that motivates this question is that the cases in which Phonological Selection is meant to apply can evidently be chosen on an ad hoc basis. This is not a fatal objection, but given that the “other mechanisms” that are appealed to suffice to derive the correct distributions both in some cases of PCA, and in all cases of grammatically conditioned allomorphy, the benefits of Phonological Selection are quite limited. That is, since morphological ordering mechanisms could account for the whole system, whether the allomorphy is grammatically or phonologically conditioned, why is it ever necessary or desirable to appeal to phonological constraints? In the absence of a strong empirical argument that Phonological Selection is required, there are only conceptual arguments, based on Putative Loss of Generalization (PLG).

One way of allaying some of the concerns about the ad hoc application of Phonological Selection would be to demonstrate that the analysis of individual cases of PCA in some language generalized throughout the language in some interesting way. The next sections address this point, by looking at systems of PCA in detail.

5.1.4 Systems of Allomorphy: Some Questions

Many languages of Australia show phonologically conditioned allomorphy of different case endings. In the analysis of these alternations, particular attention is often focussed on the ergative case, for reasons that are made clear below. Beyond the details associated with this case in particular, the *systems* of case inflection provide a fertile ground for illustrating the differences in perspective that different frameworks offer for interactions between morphology and phonology. The systemic aspect of this is crucial. What looks “phonologically natural” when one case is examined often looks much less like this when other cases are brought into the picture. It is always possible to extract part of “the data” and construct a teleological explanation of why they are the way they are; in some

sense, there should be no upper bound to the number of possible teleologies of this type. Part of the promise of Phonological Selection is that an account in which phonology drives allomorph insertion should be able to extend throughout systems of PCA in the same language in a straightforward, and thus offer some explanatory advantages that reach beyond a limited subset of the facts.

Above I reviewed two Globalist analyses of genitive allomorphy in Djabugay. Even though analyses like these must be taken as “toy” illustrations, because they do not aspire to any level of detail either within one language’s case system, or across more than one language, the message that they intend to convey is clear: allomorphic selection involves Phonological Selection in a way that accounts for generalizations that must be regarded as accidental from the Localist point of view. Putting the conceptual part of this to the side, the discussion of the following sections takes the claim that Phonological Selection is necessary at face value by attempting to work through case systems in which PCA is abundant, and asking to what extent significant generalizations are missed if Phonological Selection is ignored.

5.2 Djabugay Case Allomorphy

Djabugay shows *-:n* and *-ŋun* allomorphs of the genitive morpheme, distributed according to the final segment of the host noun. The examples from above are repeated in (9) for convenience:

(9) Genitive allomorphy

	ABS	GEN	Gloss
V-Final	guludu	guludu-:n	‘dove’
	gurra:	gurra-:n	‘dog’
C-Final	gaŋal	gaŋal-ŋun	‘goanna’
	girrgirr	girrgirr-ŋun	‘bush canary’

As far as Phonological Selection goes, the degree to which the phonology of surface forms drives the selection of allomorphs is already somewhat compromised in the analyses of Kager and Mascaró, in the sense that both of these papers have to resort to non-phonological ordering in order to analyze even this case. When the discussion moves to the rest of the case system, it becomes clear that the potential role for Phonological Selection is reduced even further.

The table in (10) shows the forms of ergative case affixes. The organization of allomorphs in (10) is centered on the admissible final consonants /m, n, ɲ, l r r, y/ of the language:^{8, 9}

(10) Ergative Allomorphy (Patz 1991:264)

	Env.	Allomorph	Noun	Ergative	Gloss
a.	stem/V/	-ŋgu	ɲumbu	ɲumbu-ŋgu	‘father’
b.	stem/rɾ/	-u	wumbarr	wumbarr-u	‘puppy’
c.	stem/l,r/	-ndu	baɖigal	baɖigal-ndu	‘turtle’
d.	stem/m/	-uŋgu	wulam	wulamu-ŋgu	‘perch’
e.	stem/n/	-ndu	buŋan	buŋa-ndu	‘sun’
f.	stem/C[+pal]/	-ɲɖu	ɖawarray	ɖawarra-ɲɖu	‘thunderstorm’
f’.			murray	murra-ɲɖu	‘fever’

These facts raise several questions of interest for the analyses of genitive allomorphy presented above; for example:

- Kager’s (1996) general prediction is that the “default” allomorph must be the smallest one. In (10), this means that the ergative should manifest a language-specific instantiation of this universal economy constraint in the form of the constraint $ERGATIVE=U/$. The way that Kager’s theory works, the dispreferred allomorph(s) should only surface when the preferred one violates higher-ranked syllable structure constraints. We should thus expect to find e.g. *-u* throughout the consonant-final forms in (10), contrary to fact.
- There is what looks like epenthesis in (10d). This raises the question why epenthesis cannot “rescue” any of the relevant genitive candidates— where *-:n* with C-final stems is eliminated by a constraint banning complex codas— while the evidently epenthesizing candidate (10d) can win in the case of /m/-final ergatives (recall that MAX/DEP are ranked above PRIORITY above in Mascaró’s analysis of genitive in (8)). In addition to this, deletion is found in (10e/f/f’), where stem-final consonants are eliminated.
- Affixation in (10e/f/f’) is opaque, because the stem-final consonant is deleted. There is no reason why, in the analyses that we have seen to this point, the phonology should not have the “default” or prioritized allomorph (i.e., the one that occurs after V-final hosts) *-ŋgu* in these cases, since the “conditioning” stem-final consonant does not appear in the surface form.¹⁰

None of these facts are considered by Kager or Mascaró, who restrict their attention to the genitive. The intuitive appeal of something like Phonological Selection may or may not be felt when attention is restricted in this way. After all, the point of both Kager’s and Mascaró’s treatments is that phonology alone cannot account for the distribution of allomorphs. In any case, the idea that simple phonological considerations account for the attested patterns loses much of its force in the context of the ergative, where the analysis that is required for the genitive could not derive the facts without significant modification. This raises one of the questions considered above: if the “phonological” constraints required for allomorph distribution must be specified on a case-by-case basis, it is hard to see how this could be a success for Phonological Selection.

Additional points along these lines arise when other cases are taken into account. As a first step towards a more comprehensive analysis of the case system, consider the “instrumental and locative” (inst/loc) case forms:

(11) Inst/Loc (Patz 1991:265)

	Env.	Allomorph	Noun	Inst/Loc	Gloss
a.	$\sigma\sigma/V/$	-:	mara	mara:	‘hand’
b.	stem/V:/	-la	ɖina:	ɖina:-la	‘foot’
b’	not-($\sigma\sigma$)/V/	-la	digarra	digarra-la	‘sand’
c.	stem/rr/	-a	biwurr	biwurr-a	‘spear’
d.	stem/C/	-nda	diŋal	diŋal-nda	‘egg’
e.	stem/m/	-unda	gurrŋam	gurrŋamu-nda	‘flame tree’
f.	stem/n/	-nda	ɖulbin	ɖulbi-nda	‘tree, log’
g.	stem/C[+pal]/	-ɲɖa	guguy	gugu-ɲɖa	‘centre’
g’.			buɖaɲ	buɖa-ɲɖa	‘beetle sp.’

Although there are some effects that are unique to this case, there are some clear parallels with what happens in the ergative, especially with assimilation of the affixal consonants to adjacent

segments: specifically, *-nda* and *-nda* in the inst/loc correspond to *-ngu* and *-ngu* in the ergative. From a comparative perspective, correspondences between the ergative and inst/loc along these lines are unsurprising. There is a long-standing observation within the comparative study of Australian languages that the locative case endings of the type represented by Djabugay *-nda* are similar to or the same as the *-ngu* set of ergative suffixes, with the difference that the locative ones have the vowel /a/ in place of /u/.¹¹

The series of affixes consisting of a nasal and a homorganic stop plays an important role in this system. I refer to such morphemes with the abbreviation *-^NC-affixes*.

The situation in Djabugay reflects the historical connection between ergative and locative in part, except that the locative never surfaces as *-nga*. For the purposes of the synchronic analysis of the case system, there seems to be a single *Assimilation* process that applies to certain ergative and inst/loc endings (but not to other case endings; see below), by which the ^NC-affixes acquire place features of consonants to their left.

Assuming this assimilation rule, and an additional epenthesis process (the latter for the /m/-final stems), VI for ergative can be reduced to *-ngu* and *-u*. In the locative, there is *-:*, *-la*, *-a*, and *-nda*. I will assume for the moment that the first of these is a \emptyset VI that triggers a lengthening Readjustment Rule, although nothing critical hinges on exactly this implementation; the notation *-:* is used to stand in for this analysis in the discussion below.

Further reduction and decomposition is possible in both the ergative and inst/loc. In particular, the ^NC- component of *-ngu* and *-nda* is eliminated with /rr/-final stems, suggesting the following rule:

$$(12) \quad -^N\text{C-} \rightarrow \emptyset / \text{STEM/rr/} _ _$$

With the rule (12), there is no need for an *-u* exponent in the ergative, and the spell out of this case can then be reduced to the VI with the exponent *-ngu*. Similarly, the *-a* in the inst/loc can be eliminated as a separate exponent.

In addition, it can be assumed the ^NC-affixes also trigger in some cases the deletion of stem-final consonants.

Taking the description above at face value amounts to positing the following VIs:

(13) Case Spell-Out: Provisional

a. Ergative

$$\text{ERG} \leftrightarrow \text{-ngu}$$

b. Instrumental/Locative

$$\begin{aligned} \text{INST/LOC} &\leftrightarrow \text{-:/ } (\dots\text{V})\text{ } _ _ \\ \text{INST/LOC} &\leftrightarrow \text{-la/ } \text{V } _ _ \\ \text{INST/LOC} &\leftrightarrow \text{-nda} \end{aligned}$$

The full range of surface forms is derived from *-ngu* and *-nda* via assimilation and the other rules mentioned above. An obvious question is whether this assimilation is part of the normal phonology. The behavior of other case affixes shows that it is restricted to ^NC- affixes in the ergative and inst/loc. So, for example, the dative case is realized as *-:nda* after V-final stems, and *-ngunda* after consonants. This latter distribution includes C-final nouns that end in a palatal, where the ergative

shows assimilation. The dative is not subject to the same assimilation (and other) processes that affect ergative *-ŋgu* and locative *-ndu*. Similarly, the genitive in *-ŋun* does not show assimilation. With assimilation versus non-assimilation in mind, the four cases discussed to this point can be arranged as follows:¹²

(14) Assimilating versus Not Assimilating

Case	Form	Env.	Noun	Affixed	Gloss
Ergative	-ŋgu				
Inst/Loc	-:	($\sigma\sigma V$)/__	mara	mara:	'hand'
	-la	V(:)/__	d̥ina:	d̥ina:-la	'foot'
	-nda				
Genitive	-:n	V__	guludu	guludu:n	'dove'
	-ŋun	C__	gapal	gapal-ŋun	'goanna'
Dative	-:nda	V__	yaba	yaba:-nda	'elder brother'
	-ŋunda	C__	ganəŋgirray	ganəŋgirray-ŋunda	'younger brother'

It is clear from these facts that the morphophonological assimilation rule cannot simply target nasal-initial affixes at syllable boundaries, because it would wrongly predict assimilation with genitives and datives, whose exponents are also nasal-initial. The process must be restricted to ^{-N}C-affixes.

5.2.1 Case Decompositions

One question that arises at this point is whether, given a set of morphophonological processes that make specific reference to ergative and locative ^{-N}C- exponents, there might be loss of generalization if these particular case affixes are included by list in the morphophonological rules of assimilation etc. That is, given that the exponents of ergative and inst/loc are quite similar to one another— *-ŋgu* for ergative, *-nda* for inst/loc— one way to account for the fact that there is parallel morphophonological behavior in exactly these cases would be to analyze them as sharing the ^{-N}C component as a morpheme. If the ergative were ^{-N}C-u-, and the corresponding allomorph of inst/loc ^{-N}C-a-, then the various processes would all be applying to the same morpheme.

As a general point, the decomposition of case (or case-number) affixes has a precedent in the literature, particularly within the context of theories with *Fission* of morphemes (see Noyer 1997; also Halle 1997 and Halle and Vaux 1998 for slightly different views). The idea that at least some case endings in certain Australian languages are built out of other case endings— i.e., that they are internally complex— is also discussed in the literature (see Dixon 2002, 5.2; this is not a proposal that has been made for the ergative and locative, as far as I am aware).

It appears that in the synchronic analysis of Djabugay, there is little motivation for positing a shared ^{-N}C- morpheme for ergatives and inst/loc. The inst/loc morpheme never surfaces as *-ŋga*, as would be expected if there were an *-ŋg* component common to ergative and inst/loc. In part this is because -: and *-la* appear with V-final nouns; these are the environments in which the default (i.e. underlying) form of *-ŋga* should be found. Moreover, there are other places in the system where the locative does not pattern as predicted if the two cases in question shared a *-ŋg* component. For example, if the underlying form in the inst/loc were *-ŋga*, then *-ŋga* should surface after the epenthetic /u/ in the /m/-final nouns, in the same way that we find *-ŋgu* in this environment in the ergative. The inst/loc does not show this form, and there is no reason to think that the *-nd/-*

that is found in this environment for the inst/loc derives from *-ŋga* via some (morpho)phonological process, because if this were the case, we would equally expect to find *-undu* in /m/-final ergatives.

Overall, it seems preferable to take the underlying representation of the relevant inst/loc morpheme to be *-nda*.

While there is no evidence for decomposition of ergative and inst/loc in a way that makes them share a piece, breaking down case affixes is motivated in other parts of the system. In particular, the dative morphemes seen above are simply the genitive morphemes, plus *-da*. This accounts for the fact that, in V-final and C-final environments, the first component of dative *-:nda* and *-ŋunda* mirrors the genitive *-:n* and *-ŋun*. Within a system of case features like that advanced in Halle and Vaux 1998, these two cases have the following features:

(15) Genitive and Dative

	Gen	Dat
Oblique	+	+
Structural	+	+
Superior	-	+
Free	+	+

The mechanisms responsible for producing case features in the language create nodes with the feature specification of the dative and genitive in the appropriate syntactic contexts. The dative nodes undergo the rule of *Dative Splitting* (16a) prior to Vocabulary Insertion to yield two distinct nodes; then the Vocabulary Items in (16b) then produce the desired results:

- (16) a. *Dative Splitting*: [+obl +str +sup +free] → [+obl +str] [+sup +free]
 b. VIs

[+obl +str]	↔	-:n	/V__
[+obl +str]	↔	-ŋun	/C__
[+sup +free]	↔	-da	

The rule (16a) is a Fission rule that splits a node with the features for the dative case into two distinct nodes. Each of these nodes is then subjected to VI. The two morphemes *-:n* and *-ŋun* (called *genitive* above) thus win competitions for insertion under two sets of circumstances: first, with nodes that are “genitive” in the sense of (15) from the beginning; and, second, nodes with the feature content [+obl +str] that are the product of (16a).

Continuing with the spell out of the case morphemes, I assume that the case features involved in the system as a whole are as follows (see Halle and Vaux 1998:225):

(17) Case features

	Nom	Acc	Gen	Dat	Loc	Inst	Abl	Erg
oblique	-	-	+	+	+	+	+	-
structural	+	+	+	+	-	-	-	+
superior	+	-	-	+	-	+	+	+
free	+	-	+	+	-	-	+	-

Putting the different aspects of the analysis together, the case inflections are inserted with the Vocabulary Items in (18):

(18) Vocabulary Items

[-obl +str +sup -free]	↔	-ŋgu	(ERG)
[+obl -str -free]	↔	-: /(...V)_	(LOC/INST)
[+obl -str -free]	↔	-la /V_	(LOC/INST)
[+obl -str -free]	↔	-nda	(LOC/INST)
[+obl +str]	↔	-:n /V_	(“GEN”)
[+obl +str]	↔	-ŋun /C_	(“GEN”)
[+sup +free]	↔	-da	(DAT)

Other aspects of the surface forms of these morphemes are the product of rules that effect the changes described in (19), which apply to the affixes that begin with ^{-NC}-:

(19) *Morphophonological Rules*

- a. *-^{NC}- Assimilation*: ^{-NC} affixes assimilate in place
- b. *Epenthesis*: ^{-NC} affixes have epenthetic /u/ after /m/
- c. *Deletion1*: ^{-NC} affixes have the ^{-NC}-component deleted after /rr/
- d. *Deletion2*: C[+pal] → Ø/_^{-NC}

There are two possibilities for the triggering of these morphophonological rules. One is that the affixes that undergo them must simply be marked; i.e.

(20) *-ŋgu⁺, -nda⁺*

The other possibility— motivated perhaps only by looking at the assimilation effects— would be to attempt a phonological solution, in which the ^{-NC}- morphemes are underspecified to make Assimilation an automatic consequence. Whether this would work for that rule, it is not the case that the behavior of ^{-NC}- affixes with respect to *Epenthesis* and *Deletion* follows in the same way. In the end, the fact that some exponents are subject to these processes and others are not is something that does not derive from other aspects of the phonology of the language.

5.2.2 Summary

The distribution of the genitive allomorphs *-:n* and *-ŋun* is employed in the works cited at the beginning of this section to generate the impression that there is strong motivation for Phonological Selection in cases of PCA. The question that launched the more detailed investigation of Djabugay case inflections above is whether, when this sort of case system is considered in detail, there is a role for Phonological Selection; secondarily, whether the claims made for Phonological Selection in the analyses of genitive allomorphy could generalize in any interesting sense.

In terms of these questions, the conclusions of this case study can be summarized as follows:

- **MAKING PHONOLOGICAL SENSE** According to the analyses from Kager and Mascaró, affixation of the genitive makes partial phonological sense, as brought out in the discussion above. In the ergative, however, there are many examples of affixation that create codas (e.g., all instances of *-ndu* with C-final stems). On the surface, ergative case is realized as *-u* with /rr/-final stems. If the *-u* exponent of the ergative were inserted after other C-final nouns, the phonological markedness created by the resulting coda would be avoided (similar points come

up in the inst/loc case). This does not happen. There are ways of avoiding this expectation—e.g., grafting on ordering solutions in which *-u* is dispreferred— but these are simply fixes that prevent the strong expectations of Phonological Selection from being instantiated.

- **PHONOLOGICAL CONSISTENCY** As noted earlier, the pattern of genitive allomorphy with *:-n* and *-ɲun* only makes sense if there is no Epenthesis/Deletion. This is what motivates ranking DEP and MAX above the constraint banning complex codas in Mascaró’s analysis in (8). However, in the ergative there is both Epenthesis and deletion. On the whole, the system requires morphophonological rules that are specific to certain case affixes. This is unavoidable on any analysis, but a consequence of this fact is that there is little potential role for Phonological Selection when the details of the system are considered.
- **TRANSPARENCY** Affixation of *-nda* in the inst/loc of /m/-final stems is found with epenthetic /u/, just like in the ergative. In the inst/loc, the epenthesis renders insertion of *-nda* opaque, since, in V-final contexts, *-la* (or *-:*) is inserted. This kind of opacity raises a general set of questions for theories with Global-MP. The general set of issues connected with opaque interactions is examined in Chapter 6.

Overall, it is clear that the analysis of genitive allomorphy based on the phonological constraint against complex codas cannot be extended to the rest of the case system in any obvious way. As acknowledged in Chapter 4, and in the introductory remarks to this chapter, it is impossible to argue against Phonological Selection by showing that it is not relevant in some system or other. At the same time, analyzing systems like Djabugay in detail is important because it provides some insight into how intuitions about Phonological Selection line up with complex systems of allomorphy. The factors identified in the analysis above are (i) a limited set of allomorphs, whose distribution is determined by elements in the local phonological context of the node showing allomorphy, interacting with (ii) a number of morphophonological rules that apply subsequent to this, changing the shapes of the morphemes and their hosts.

My claim is not that these facts can be analyzed only by a Localist theory (although it remains to be seen what form a Globalist account would take); rather, the point is that there is little in this system to suggest that important generalizations are missed by a theory that makes no use of Phonological Selection.

5.3 Yidij Case Allomorphy

The language Yidij— closely related to Djabugay— is described and analyzed in work by Dixon (1977a,b). The case morphology in this language shows phonologically conditioned allomorphy that looks in some ways to be very similar to some of the patterns analyzed above. There is, however, a further set of factors that make Yidij an important case study for the relationship between morphology and phonology. The patterns of case allomorphy interact with an set of (morpho)phonological processes, in a way that produces a complex pattern of vowel length alternations and alternations between “long” and “short” allomorphs of particular morphemes. Crucially— and this is Dixon’s insight into this system— these patterns can be stated in a clear and simple fashion if morphological and (morpho)phonological processes interact serially, in such a way that makes the connection between the vowel length and the allomorphic patterns opaque in the surface forms.

The relationship between allomorphy and vowel length provides an important illustration of the strengths and weaknesses of Phonological Selection. Looking only at the surface manifestations of case allomorphy, it appears that an account based on Phonological Selection is very promising for Yidij. A theory in which a constraint requiring exhaustive footing is able to predict many allomorphic alternations. However, accounting for allomorphy in this way makes the vowel length alternations impossible to state in a simple way. Thus, when the system as a whole is considered, the motivation for Phonological Selection disappears.

5.3.1 Preliminary View of the Cases

The ergative case in Yidij shows the forms in (21), which are organized according to V-final nouns (21a,b), stop-final nouns (21c), rhotic-final nouns (21d), and glide-final nouns (21e):

(21) Ergative

	Root = ABS	ERG	Gloss
a.	yabi	yabi:-ŋ	‘grey possum’
b.	waguḍa	waguḍa-ŋgu	‘man’
c.	ḍuḍum	ḍuḍu:m-bu	‘father’s sister’
	guban	guba:n-du	‘big butterfly’
	ŋurbirbiŋ	ŋurbirbiŋ-ḍu	‘leech’
	wagal	waga:l-du	‘wife’
	warabal	warabal-du	‘flying squirrel’
d.	wuḍar	wuḍa:-du	‘dew,frost’
	gugaṭ	guga:-du	‘large guana’
	maŋgumbar	maŋgumba(r)-du	‘leaf grub’
	buliyiṭ	buliyi(ṭ)-du	‘chicken hawk’
e.	gunduy	gundu:(y)-(ŋ)ḍu	‘brown snake’

Vowel-final stems show *-ŋ* alternating with the familiar *-ŋgu*, based on even versus odd syllable count, as seen in (21a) versus (21b). Despite appearances, this alternation does not involve distinct Vocabulary Items; below, I follow Dixon in accounting for it in terms of a deletion rule that applies throughout the language. In the C-final stems, the nasal component is either absent (21c), or absent along with deletion of the stem-final sonorant consonant (21d).¹³

Taking (21) as a whole, it is possible to posit a single *-ŋgu* allomorph for the ergative, and derive the surface forms in the morphophonology. This requires phonological rules that delete the nasal component and assimilate the stop component to the stem-final consonant. Other phonological alternations seen throughout (21), which involve deletion of word-final material, and lengthening of vowels, are analyzed in detail in later subsections.

The locative, instrumental, and allative cases syncretize for nouns in Yidij. I use *locative+* as a cover term for this case form. The allomorphs of *locative+* forms are shown in (22):

(22) Locative/Allative/Instrumental

	Root = ABS	LOC+	Gloss
a.	buṛi	buṛi:-	‘fire’
b.	gabudu	gabudu-la	‘white clay’
c.	muḍam	muḍa:m-ba	‘mother’
	wardan	warda:n-da	‘boat’
	yidiṅ	yidi:ṅ-ḍa	‘language name’
	muygal	muyga:l-da	‘hole, trap’
d.	baṅguṭ	baṅgu:-da	‘fish spear’
	maṅgumbar	maṅgumba(r)-da	‘leaf grub’
	guṅgambuṭ	guṅgambu(ṭ)-da	‘butterfly sp.’
e.	gabay	gaba:(y)-ṅḍa	‘path, track’

With V-final stems, locative+ is marked by final lengthening alone in disyllabics; with trisyllabic nouns, the affix *-la* appears. This pattern is related to the *-ŋ/-ŋgu* alternation in the ergative; the distributional conditions under which the alternation occurs are identical. However, the alternation between lengthening and *-la* is in some sense unpredictable as far as the phonology goes, since it is predicted that “long” *-la* will alternate with “short” *-l*, parallel to how *-ŋgu* and *-ŋ* alternate in the ergative.¹⁴ In C-final stems, locative+ is realized as an assimilating stop (22c), *-da* plus deletion of the stem-final consonant with rhotics (22d), and with assimilated *-ṅḍa* and variable deletion of the stem-final consonant with final /y/ (22e).¹⁵

In a way that parallels the Djabugay case system, other case endings do not assimilate to adjacent consonants in the way that the ergative and locative+ exponents do. Sets of inflected forms illustrating this and a number of additional points of morphophonological interest are shown in (23), where nouns are organized by V-/C-final stems, and odd/even syllable count:

(23) Nouns/Case Endings (Dixon 1977a:57)

	$\sigma\sigma V$	$\sigma\sigma\sigma V$	$\sigma\sigma C$	$\sigma\sigma\sigma C$
	‘kangaroo sp.’	‘initiated man’	‘hornet’	‘tortoise’
ABS	mabi	mula:ri	biṅḍin	baḍi:gal
ERG	mabi:-ŋ	mulari-ŋgu	biṅḍi:n-du	baḍi:gal-du
DAT	mabi:-nda	mulari-nda	biṅḍi:n-da	baḍi:gal-nda
PURP	mabi:-gu	mulari-gu	biṅḍi:n-gu	baḍi:gal-gu
LOC	mabi:-∅	mulari-la	biṅḍi:n-da	baḍi:gal-da
ABL	mabi-m	mulari-mu	biṅḍi:n-mu	baḍi:gal-mu
COM	mabi:	mulari-yi	biṅḍi:n-ḍi	baḍi:gal-ḍi
GEN	mabi:-n	mulari-ni	biṅḍi:n-i	baḍi:gal-ni

Throughout these forms, there are alternations between long and short versions of the case affix: along with *-ŋgu/-ŋ* in the ergative, there is *-mu/-m* in the ablative, and *-ni/-n* in the genitive.¹⁶

In addition to this alternation in the affixes, the forms in (23) also show changes in vowel length. With the exception of a few words, vowel length does not exist in underlying forms in Yidiṅ; it appears as the result of a phonological rule. Crucially, this lengthening rule interacts with the principles governing the allomorphic effects in the case system, as can be seen when the morphophonology of Yidiṅ is considered in greater detail.

5.3.2 Morphophonological Interactions

Dixon's (1977a,b) rules accounting for long/short allomorphy make reference to syllable count, and in subsequent approaches in the metrical framework like Nash 1979 and Hayes 1982 this factor is treated in terms of foot structure.

I assume that Yidiñ words are footed from left to right, with the insertion of] parentheses (here and below I assume a theory like that of Idsardi (1992), Halle and Idsardi (1995), and related work):

(24) *Footing*: Insert] iteratively from left to right, binary

Subsequent rules make reference to foot boundaries, and, in the case of deletion, to whether or not a particular part of the representation is footed. When footing occurs with respect to Vocabulary Insertion is an important issue; see below.

Dixon's analysis involves two rules for the vowel-length and long/short allomorph alternations. The first rule, *Penultimate Lengthening PL*, accounts for the long vowels seen in the forms above. This rule creates long vowels in the penults of odd-syllabled words. As recognized by Hayes (1982) and others following him, this process refers to foot structure; it can be stated as follows (cf. Hayes 1982):¹⁷

(25) *Penultimate Lengthening PL*: $\sigma\sigma]\sigma\# \rightarrow \sigma\sigma:] \sigma\#$

Clearly, this rule follows the footing rule in (24).

The second rule of the phonology is *Final Syllable Deletion FSD*, which accounts for long/short alternations in affixes, both in noun inflection, and elsewhere in the language. The effects of *PL* and *FSD* together are illustrated in (26), which shows the Present tense affix *-ŋ* and the Past tense affix *-ŋu* in combination with even- and odd-syllabled hosts:

(26) Dixon 1977a:44

	Even	Odd
	gali- 'go'	maɖinda- 'walk up'
Pres.	gali-ŋ	maɖi:nda-ŋ
Past	gali:-ŋ	maɖinda-ŋu

Present tense shows the exponent *-ŋ*. The exponent of past tense has the form *-ŋu*, and it surfaces in this form in quadrisyllabic *maɖinda-ŋu*. In the case of the verb *gali* 'go', the nucleus of the final syllable is deleted, yielding /ŋ/ on the surface. This is the same rule that applies throughout the case system, to yield the alternation between e.g. *-ŋgu* and *-ŋ* for the ergative case.

The interaction of *PL* and *FSD* accounts for a significant part of the morphophonological system of the language. An important component of Dixon's analysis of Yidiñ phonology is the proposal that *FSD* is ordered after *PL*, as (27) shows with reference to some different hosts and affixes:¹⁸

(27) Illustration of *PL* and *FSD*

	gali-PAST	maɖinda-DAT-SUB	buɽa-ERG	buɽa-GEN
<i>Input</i>	gali-ŋu	maɖinda-ŋu-nda	buɽa-ŋgu	buɽa-ni
<i>Footing</i>	gali]-ŋu	maɖi]nda-ŋu]-nda	buɽa]-ŋgu	buɽa]-ni
<i>PL</i>	gali:]-ŋu	maɖi]nda-ŋu:]-nda	buɽa:]-ŋgu	buɽa:]-ni
<i>FSD</i>	gali:-ŋ]	maɖi]nda-ŋu:-n]	buɽa:-ŋ]	buɽa:-n]

When *FSD* applies after *PL* in this way, it renders the distribution of long vowels opaque. This is a significant point for assessing the potential contributions of Phonological Selection in the analysis of this system; see 5.3.5.

The details of *FSD* are complicated; Dixon's formulation of the rule (1977b:48), which involves a number of conditions that must be unpacked, is as follows:

(28) Dixon's Final Syllable Deletion Rule

$$XV_1C_1(C_2)V_2\# \longrightarrow XV_1C_1\#$$

- a. if $XV_1C_1(C_2)V_2\#$ is an odd-syllabled word;
- b. and C_1 is one of the set (*l, r, ɭ, y, m, n, ɲ, ŋ*) of allowable word-final consonants
- c. and there is a morpheme boundary between V_1 and C_1

The condition (28a) specifying the syllable-count is statable in terms of foot structure, exactly as with *Penultimate Lengthening* above (cf. Hayes 1982 and Nash 1979). Beyond sensitivity to foot structure, three other aspects of the deletion process require further comment. The first is that the rule applies only to *open* final syllables. The second and third are (28b,c): the "acceptable final consonant" condition and the "morpheme boundary" condition respectively.

Dixon motivates the need to restrict the rule to deletion of open syllables with examples like those in (29);

(29) Examples

- a. gali 'go'
gali-Comitative+Conjugation-I gali:-ŋa-l, *gali:ŋ
- b. gali 'go'
gali-Causal Subordinate gali:-ŋu-m, *gali:ŋ
- c. maɟinda 'walk up'
maɟinda-Present maɟi:nda-ŋ, *maɟi:n

In each of these cases, affixation produces a closed word-final syllable that is not deleted by *FSD*. It is possible that some of the examples that are intended to illustrate this particular restriction derive from other factors. However, I will assume for present purposes that only open syllables are deleted, and build this directly into the structural description of the rule. This assumption could potentially be simplified but it is not critical for the interaction of *PL* and *FSD*.

The "acceptable final consonant" condition (28b) and "morpheme boundary" condition (28c) are more important for the general set of phonology/morphology issues under consideration here. The statement of the former condition makes it look like deletion is blocked when it would create a problem for syllable structure: only possible word-final segments may precede deleted material. In this way, it appears to require a kind of "lookahead", in which the application of the deletion process is determined by properties of the output. The kind of example that motivates this condition is seen in (30):

(30) mabi, mabi:-gu, *mabi:-g = 'kangaroo sp.-PURP'

That is, /g/ is not possible word-finally, and there is no deletion of final /u/.

The morphological boundary referred to in (28c) also implicates connections between morphology and phonology. The motivation for this restriction is not as easy to see as the motivation for the other conditions. Its effects are seen in cases in which phonologically identical words show different behavior with respect to *FSD*, in a way that correlates with differences in morphological structure. The example in (31) illustrates this restriction:

(31) *bijɖin*, *bijɖi:n-gu*, **bijɖi:n* = ‘hornet-DAT’

There is no problem with the final consonant here, since *-gu* occurs after a C-final noun, and could be deleted as a whole to leave admissible /n/ in word-final position. However, the morpheme boundary condition is not met in this form: there is no morpheme boundary between V_1 (the second /i/ of *bijɖin*) and C_1 (the final /n/). There *is* a morpheme boundary between C_1 and C_2 (the final /n/ of the Root, and the initial /g/ of the purposive affix), but this fact is irrelevant to Dixon’s rule, and now it is clear why. Evidently, there must be a morpheme boundary between the consonant to the left of the deleted material, and the material to that consonant’s left.

One possible response to the effect in (31) would be to say that the failure to delete is the result of another factor, which prohibits the deletion of entire morphemes. In all of the other cases of deletion seen to this point, there is an overt piece remaining of the morpheme that is partially deleted (recall the “short” case and tense forms). In the hypothetical deletion in (31b), the deletion process eliminates the entire *-gu* morpheme, which might suggest that the morpheme boundary condition actually reflects a ban on the deletion of entire morphemes.

Additional forms show that there is at least one type of case where an entire *-CV* affix is deleted by *FSD*. The examples in (26) show past tense verbs, which have the affix *-ju*. With disyllabic verbs like *wawa:-l*, where the *-l* is the conjugation marker, the past tense form shows no overt Tense affix. This follows from *FSD* as formulated by Dixon:

(32) *wawa-l-ju* \xrightarrow{PL} *wawa:-l-ju* \xrightarrow{FSD} *wawa:-l*

Notice that in the case of *wawa:-l*, there is a morpheme boundary between V_1 (the final vowel of the stem) and C_1 (the conjugation marker *-l*).

An alternative to positing *FSD* in this type of case, such as treating the *-ju/-∅* alternation in the past tense as suppletive allomorphy, requires an analysis in which the past tense morpheme has a *-∅* allomorph only with verbs of a particular phonological size, such that this allomorph appears in environments that are associated with *FSD* elsewhere in the language. It also makes the vowel length on the second syllable of *wawa:l* mysterious, since, as a final syllable, *PL* cannot have applied to give this length. On the other hand, positing a *-ju* that is deleted by *FSD* allows a straightforward treatment of the vowel length in terms of *PL*.

In sum, it appears that a ban against “whole morpheme deletion” is not responsible for the non-deletion of *-gu* in (31b).¹⁹

5.3.3 (Re)analysis

From the review of Dixon’s deletion rule, the two aspects of *FSD* that need to be accounted for are (i) the effect that bans deletion after impossible word-final consonants; and (ii) the (somewhat odd-looking) morpheme-boundary condition.

The first restriction can be reduced directly to factors that do not involve lookahead. In particular, the fact that *Final Syllable Deletion* does not apply when it would produce an impossible word-final

consonant derives from the fact that deletion occurs only after sonorants. This can be written directly into the deletion rule, as a contextual condition.

The second condition, which seems to directly implicate the morphological structure, reduces to the way in which deletion is sensitive to foot structure and syllabification. The effects of this condition can be captured if the deletion rule eliminates unfooted material that appears after unsyllabified sonorants.

Taking these points into consideration, the rule of *FSD* is formulated as in (33), where the notation σ° is employed for a syllable that is not footed, and material linked to *x* is unsyllabified:²⁰

$$(33) \text{ Final Syllable Deletion: } \begin{array}{ccc} \sigma^\circ & & x \\ | & \longrightarrow \emptyset / & | \\ (C)V & & C[+\text{son}] \quad _ \# \end{array}$$

The derivation of the ergative case forms for a vowel-final disyllabic and trisyllabic nouns is illustrated in (34). In these derivations, it is assumed that the Root is syllabified and footed before Vocabulary Insertion (VI) applies to functional heads attached to the Root. Following VI at these nodes, a second round of syllabification and footing applies to the exponents of the nodes that have undergone VI, and then the phonological rules *PL*, *FSD*, and *Resyllabification* apply:²¹

(34) Derivation of *-ŋ* affixation (*yabi* ‘grey possum’; *mula:ri* ‘initiated man’)

yabi-ERG	mulari-ERG	Input
yabi]-ERG	mula]ri-ERG	Syllabification/Footing
yabi]-ŋgu	mula]ri-ŋgu	VI
yabi]-ŋgu	mula]ri-ŋgu]	Syllabification/Footing
yabi:]ŋgu	--	<i>PL</i>
yabi:]ŋ	--	<i>FSD</i>
yabi:ŋ]	mula]riŋ-gu]	<i>Resyllabification</i>

The syllabification that takes place after VI looks at the phonological representation of affixal material. In sequences of affixes, like *-l-ju* Conjugation-Tense, or for affixes like *-ŋgu* ergative, syllabification after VI produces a representation in which the initial segment is unsyllabified. As shown in the derivation in (34), *Resyllabification*– integration of these segments with the already-syllabified Root– occurring late in the derivation, after *PL* and *FSD* have applied. This is crucial in explaining the cases that motivated Dixon’s “morpheme boundary” condition.

To illustrate how this proposal captures the effects of Dixon’s morpheme boundary condition, I will employ the pair *wawa-l-ju* ‘see-CONJ-PAST’, which surfaces with the final syllable deleted as *wawa:l*, versus *guygal-du* ‘bandicoot-ERG’, which does not show *FSD* and surfaces as *guyga:ldu*, not **guygal*. In the analysis that implements deletion with (33), the difference between these forms has to do with the way in which material is footed, depending on whether or not it is part of the Root’s phonology, or the exponent of a morpheme that undergoes VI. Prior to VI, the *wawa*-form and the *guygal* form have the representations in (35):

- (35) Representations prior to VI
- a. wawa]-CONJ-T[past]
 - b. guygal]-ERG

When VI occurs, the exponents of the morphemes CONJ, T[past], and ERG shown in (36) are inserted, and Syllabification and Footing apply:

(36) Representations after VI

- a. wawa]-l-ju
- b. guygal]-du

In each of these examples, no new feet are created in the second cycle, because the footing processes groups only sequences of two syllables (i.e. it creates binary feet). The affixal material *ju* and *-du* is unfooted, and thus potentially able to undergo *FSD*.

The important asymmetry that accounts for why there is deletion with the *wawa* form but not the *guygal* form is that in (36a), the sonorant is unsyllabified, whereas in (36b), it is syllabified as part of the root. It follows that Root-final sonorant consonants, like the final /l/ of *guygal*, cannot trigger deletion, since the *FSD* rule is triggered only by *unsyllabified* sonorants. On the other hand, affixal sonorants, like the conjugation /l/ in *wawa:-l*, are outside of the foot boundary. This consonant is not syllabified with the Root, and *FSD* applies accordingly.

The analysis of the different rules of Yidiñ discussed above, and incorporating (33), is illustrated in (37) for nouns and verbs of different sizes; Syll/Foot abbreviates Syllabification and Footing.²²

(37) FSD and “Morpheme Boundaries”

‘bandicoot’	‘see’	‘tortoise’	‘go’	
guygal-ERG	wawa-CONJ-PAST	baɖigal-ERG	gali-COM-CONJ-PAST	Input
guygal]-ERG	wawa]-CONJ-PAST	baɖi]gal-ERG	gali]-COM-CONJ-PAST	Syll/Foot
guygal]-du	wawa]-l-ju	baɖi]gal-du	gali]-ŋa-l-ju	VI
--	--	baɖi]gal-du]	gali]-ŋa-l-ju]	Syll/Foot
guyga:l]-du	wawa:]l-ju	--	--	PL
--	wawa:]l	--	--	FSD
--	wawa:l]	--	--	Resyll.

To summarize, the work done by Dixon’s morpheme boundary condition is done on this analysis by the requirement that an unsyllabified sonorant precede the deleted material. Sonorants that are part of the root are syllabified early, in the first application of Syllabification and Footing. In some cases affixal sonorants cannot be syllabified with other affixal material; moreover, these consonants are not Resyllabified as codas until late in the derivation. These sonorants trigger *FSD* when the other conditions on this rule are met, whereas Root-final sonorants do not. This produces an asymmetry with respect to *FSD* that is derivative of morphological structure.

5.3.4 Putting the Components Together

Although the phonological processes required in this system are complex (for deletion in particular), the overall analysis is one in which the surface complexity reduces to an analysis in which there is a small set of Vocabulary Items, along with a set of phonological operations that apply to these. The Vocabulary Items required for Yidiñ are as follows (for simplicity the cases are not decomposed into features):²³

(38) VIs for Case

ERG	↔	-ŋgu	
LOC	↔	-la	
PURP	↔	-gu	
DAT	↔	-nda	
ABL	↔	-mu	
COM	↔	-yi	/V [˘] —
COM	↔	-ɟi	/C [˘] —
GEN	↔	-ni	

In addition, the phonological rules posited above must be applied, in the order shown at the end of the preceding subsection.

Beyond this, there are a few additional points that have to be noted:

- For the locative+ of a vowel-final disyllabic host, the rules given above produce final *-l*; so, for e.g. *buŋi* ‘fire’, locative+ should be *buŋi:l*. As noted earlier, these forms surface with final lengthening: *buŋi:ː*. The deletion of the final /l/ is something that has to be accomplished by some additional rule, on any analysis.
- Forms with the ablative do not undergo *Penultimate Lengthening* unless the syllable in question is closed prior to affixation. Thus we find *bupa-m* ‘woman-ABL’ rather than the expected **bupa:-m*, but *guyga:l-mu* ‘bandicoot-ABL’ with a long vowel.
- The dative morpheme *-nda* is not subject to *Final Syllable Deletion*. Thus we find *mabi:-nda* ‘kangaroo sp.-DAT’, not **mabi:-n*.

Overall, the analysis of Yidij looks very much like the analysis of Djabugay advanced above.

5.3.5 Phonological Selection Obscures Generalizations

An important aspect of the analysis presented above, one which follows Dixon’s rule-based treatment, is that morphology— specifically, Vocabulary Insertion— and phonology are distinct. This architectural assumption allows for a uniform explanation of (i) the distribution of vowel length, and (ii) the alternation between “long” and “short” allomorphs of the case affixes. It is not clear how these two effects can be correlated in a surface-based treatment, because deletion renders the distribution of long vowels opaque: long vowels that derive from *Penultimate Lengthening* often appear in word-final position because of the application of *Final Syllable Deletion*.

The correlation between these rules is important because part of the Yidij case system might appear to be a promising case for Phonological Selection. If attention is restricted to the long/short allomorph alternation, the choice of allomorphs of the ergative case in e.g. *mabi:-ŋ* versus *baɟigal-du* might suggest an analysis in terms of syllable structure constraints: choose the -CV allomorph when the -C allomorph would produce an unacceptable word-final cluster or a violation of a constraint against complex codas *CC. Moreover, the “long” alternants are affixed to hosts with an odd number of syllables, to yield words that can be exhaustively parsed into binary feet. This suggests a role for PARSE-SYL, which penalizes representations with unfooted material. As shown in (39), PARSE-SYL must be trumped by the condition against complex codas *CC, which is distinct from the general NOCODA constraint that appears lower in the ranking (nouns here are *mabi* ‘kangaroo sp.’, *muygal* ‘hole, trap’, and *mula:ri* ‘initiated man’):²⁴

(39) Phonological Selection in Yidjɪn

		*CC	PARSE-SYL	NoCODA
a.	☞ mabi:-ŋ]			*
	mabi:]ŋgu		*!	
b.	muyga:l-ŋ]	*!		**
	☞ muygal]-du		*	**
c.	mula:]ri-ŋ]		*!	*
	☞ mula:]ri-ŋgu]			*

Looking just at the case morpheme alternations, (39) derives the correct results for this particular allomorph alternation, and it does so with phonological constraints. Thus far, the prospects for Phonological Selection are good. However, this type of analysis encounters immediate difficulties elsewhere in the system: specifically, it precludes a straight-forward metrical treatment of *Penultimate Lengthening*. The simple conditioning environment for this process— penultimate syllables of the type specified above— cannot be appealed to, since, on an analysis like the one given in (39), the long vowels in (39a) and similar cases are word-final.

Appealing to some other metrical factor to account for length— e.g., the idea that (final) iambs have lengthening, framed in terms of a preference for uneven iambs— does not look promising. Absolutive forms that are disyllabic and phonologically identical to those with lengthening do not show long final syllables: *guban* ‘big butterfly’, for example. Nor, for that matter, do quadrisyllabic words (e.g. *baḏigaldu* ‘tortoise-ERG’) show lengthening of the final vowel.

One possible attempt at a fix to this problem would be to divide the nouns of the language into distinct noun classes, based on their behavior with respect to vowel length. The nouns would fall into one of the following two classes: an “even” class in which a long vowel appears in affixed forms, and an “odd” class, in which a long vowel appears in the base form (that is, the Absolutive). The idea would be to make the length alternation (at least in some cases) “morphological”, so that there are two “declension classes” in which class membership is marked by length in the ways described above.

This type of approach does not appear to be on the right track. At the most basic level, it would fail to explain why there should be two distinct noun classes defined morphologically, with long vowels being found in one class word-finally, in the other class in penultimate syllables. Given that verbs show a similar set of alternations, in the same phonological environments, trying to make length a morphological manifestation of noun-class membership is missing the point.²⁵

Thus while it looks like Phonological Selection might have something to say about the allomorphy of case affixes, it can only do this at the expense of an analysis of *PL*. The Localist analysis presented here takes allomorph selection and morphophonology to be distinct. It accounts for the facts, and does so in a way that accounts simultaneously for generalizations about affix allomorphy and the length distributions.

5.4 Conclusions

This chapter examines Phonological Selection, as one way of looking at the architectural premise that morphology and phonology are computed in the same global system (Global-MP). Strong Phonological Selection— the idea that the phonology alone suffices to determine all cases of PCA—

was shown to be untenable in the early literature on allomorphy in OT. It is simply not the case that the “regular phonology” suffices to produce the right patterns in PCA. The broader question that is addressed subsequent to this is whether there is any evidence that Phonological Selection is nevertheless required, even in “hybrid” theories that introduce morphological ordering into the picture. The answer seems to be negative: the only arguments in favor of these Globalist approaches are conceptual; i.e., they stem from Putative Loss of Generalization.

Moving beyond this into the more complex case studies of Djabugay and Yidij case inflections, the discussion centers on the intuition behind Phonological Selection, and the question of whether Globalist analyses of allomorphy can generalize. What is proposed above is that the proper analysis of these systems involves an architecture in which competition for insertion (morphology) is sharply distinguished from subsequent phonology. As shown in the analysis of Djabugay cases, the idea that Phonological Selection is necessary fades when the treatment moves past a few carefully selected forms. Even in cases where there appears to be *prima facie* support for “output” considerations, like in Yidij, a careful consideration of the relevant facts shows that the surface phonology does not drive allomorph selection, and that surface-based analyses miss important generalizations.

One possible move for a Globalist theory would be to say that all of the effects studied in this chapter are simply morphological in nature, and that Globalist theories like OT are not responsible for them, because such theories are instead directed at (mostly markedness-related) phonological patterns. This is a sort of non-answer. A theory of phonology must take morphology into account, because phonological effects are seen in complex forms.

In the end, arguments about intuitions are inconclusive in comparison with arguments about empirical predictions. The most important predictions concern cases in which local and global formulations of the principles driving a particular alternation conflict with one another. These are the topic of the next chapter.

Potentially Global Interactions are Resolved Locally

This chapter looks directly at the empirical predictions that distinguish Globalist and Localist theories; in particular, it is centered on possible forms of evidence in favor of global computation of morphology and phonology. In the abstract, this means an argument showing that the morphological and phonological properties of some structure in some language are computed in a way that cannot be analyzed in a Localist theory.

The type of argument that dominates the discussion below is based on scenarios in which global requirements effectively “override” other, more local, considerations; schematically, this type of case is stated in (1) in a way that is tailored to the discussion of PCA:

- (1) GLOBAL INSTEAD OF LOCAL INTERACTIONS: Cases in which local phonological considerations favor one allomorph, whereas global considerations— e.g., brought about by the phonological form of “outer” affixes, or the phonology of the entire word— favor another allomorph, where it is the latter that is chosen.

More specifically, (1) refers to cases in which there is more than one allomorph for some morpheme, e.g. x_1 , x_2 , x_3 , such that (i) there is phonological conditioning of the distribution of these allomorphs; and (ii) in a case where “local” conditioning requires x_1 , and global optimization requires x_3 , the language shows x_3 .

When cases of this type are examined in greater detail, it is possible to identify different types of effects that fall under the general heading of (1); the following subcategories are examined in detail below:

- (2) Possible Instantiations of (1)
- a. “UNCONDITIONED” ALLOMORPHS/PHONOLOGICAL EFFECTS: Theories with (at least some) Global interaction between morphology and phonology (Global-MP) allow for what look like locally “unconditioned” allomorphs to be inserted, or locally “unconditioned” phonological effects to be found, in cases in which this results in globally optimal outputs.
 - b. (PHONOLOGICALLY-DRIVEN) ALLOMORPHIC VACILLATION: Globalist theories predict that there should be cases in which the allomorph that is chosen for part of the paradigm of some Root differs from the allomorph chosen in another part of the paradigm. In such a case, different allomorphs are inserted for the same Root in a way that depends on the global phonological context. The head showing the different allomorphs can be said to show *Allomorphic Vacillation* in this scenario. Crucially, these hypothesized effects could go beyond the local types of outwards-sensitive allomorphy predicted by the theory of Part I.

The search for (1) and its manifestations in (2) connects with another point. In many cases of PCA, phonological processes make selection *opaque* by removing from the surface form the phonological factor that determines the choice among competing allomorphs. Questions about opacity are natural in the discussion of Globalist versus Localist theories, for reasons that dominate discussion in the phonological literature on Parallel versus Serial rule/constraint interaction (see Idsardi 2000 for one overview).

The introduction of opacity into the discussion of allomorphy highlights the architectural predictions of Globalist theories. While it is true that opaque allomorphy presents certain challenges for theories that deny Serialism (see, for different perspectives, Vaux 2003, Łubowicz 2005, Aranovich et al. 2005, Paster 200), and Bye 2007), there is a sense in which Globalist theories also predict global effects that go far beyond normal opacity. Cases of this latter type are crucial to understanding the strong predictions of Globalism. The discussion below therefore advances via a general discussion of opacity in PCA in 6.1, with the two types of “global over local” effects outlined in (1)– UNCONDITIONED ALLOMORPHY and ALLOMORPHIC VACILLATION– at the center of 6.2 and 6.3. The main thrust of these sections is that there are situations in which the strong predictions of Globalist theories– those in (1)/(2)– could be seen, but that the interactions that are found in actual languages are those expected in a Localist framework. In particular, there is no evidence for UNCONDITIONED ALLOMORPHY, and in cases where a morpheme is expected to VACILLATE based on the shape of outer morphemes, no such alternation is found. Thus, the strong predictions of Globalism are not borne out.

In cases in which ALLOMORPHIC VACILLATION perhaps should occur, but it does not, it could be argued that this is the result of constraints that force the same allomorph to be chosen throughout a “paradigm”: PARADIGM UNIFORMITY, in the sense of Kenstowicz 1996 and related work. In 6.4, this point is addressed with reference to cases of “outwards sensitive” allomorphy. Cases of this type show “non-uniform” paradigms. At the same time, these cases show allomorphy conditioned by local, adjacent morphemes, not by phonological properties of the word. In other words, the strong predictions of Globalism are not attested, whether paradigms are uniform or not.

6.1 From Opacity Effects to Global Interactions

Opaque interactions are generally held to be problematic for Optimality Theory, for reasons that have been amply detailed in the phonological literature. Thus, the idea advanced above– viz. that effects that are related to opacity are important for understanding the strong predictions of Globalism– requires some unpacking.

Opaque allomorphic selection is in evidence in several of the examples studied in preceding chapters, including Haitian Creole definite allomorphy in 5.1, and many of the case affixes seen in Djabugay and Yidiñ in 5.2 and 5.3. The defining property is that these cases involve (i) phonologically conditioned allomorphy conditioned by some element in the host, and (ii) additional phonological processes (often, but not always, deletion) that render the allomorphic conditioning opaque.

In the Haitian Creole definite, for example, *-a* is inserted after V-final nouns, and *-la* after C-final nouns. In the subset of the V-final nouns that have epenthesis– i.e. the [+ATR] vowels– a glide is inserted. Viewed sequentially, this looks as follows for *bato* ‘boat’:

- (3) Sequence
 - a. Input: *bato*-DEF

- b. VI: bato-a
- c. Glide Insertion: batow-a

In a theory without serial steps, however, there is a *prima facie* difficulty with *batowa*. The presence of the glide in the surface form makes it effectively consonant final, such that, all other things being equal, the *-la* allomorph is expected. Put slightly differently, the surface distribution of allomorphs is complicated by this effect: the *-a* allomorph appears on the surface after both consonants and vowels, whereas *-la* appears only after consonants.

In a Serialist theory with intermediate derivational steps, this kind of interaction is expected. Specifically, in the representation that is accessed for Vocabulary Insertion *-a* is inserted, since at that stage of the derivation, the definite morpheme is next to a vowel-final host. In this type of analysis, it can be said that the definite morpheme is in the *Local Conditioning Environment* for the insertion of *-a* when VI takes place. In Serialist theories, then, the fact that the conditioning factor for some change is not “local” to the locus of the change in a *surface form* is irrelevant; the point is that at an earlier derivational stage where the relevant computation (in this case, Vocabulary Insertion) is executed, the Local Conditioning Environment for the computation is found.

The notion of Local Conditioning Environment is crucial to understanding the predictions of different frameworks. In the domain of phonological interactions, Globalist and Parallelist theories like Optimality Theory effectively dispense with the idea that being in a Local Conditioning Environment is what determines a form changing in a particular way. Instead, whether or not a surface form is changed relative to the input is determined by the globally interacting system of constraints. This makes the notion of Local Conditioning Environment epiphenomenal; to the extent that there are local interactions, this is entirely derivative of the global system of constraint interaction.

This architectural claim of Globalist theories has clear consequences for which factors are potentially visible for the purposes of allomorphic selection. Globalist theories allow for a multitude of non-local interactions, of which standard cases of opacity are a subtype. Although surface-oriented theories might have difficulties with “standard” cases of opacity, the other types of allomorphic interaction that are predicted to exist if there are no Local Conditioning Environments are crucial for testing the predictions of Globalism.

6.1.1 Opacity and Global Interactions

Some initial points about opacity and its relation to global effects can be made concrete with reference to a textbook example of opacity: epenthesis in Turkish (see e.g. Lewis 1967, Kager 2000). The 1s possessive morpheme has the form *-m*. It surfaces as such after vowel-final nouns (4a); after consonant-final nouns, affixation of *-m* is accompanied by epenthesis, so that, as seen in (4b), there is a vowel inserted between the final consonant of the host and the *-m* suffix:

- (4) a. ölçü ‘measure’
ölçü-m ‘my measure’
- b. el ‘hand’
el-im ‘my hand’

The opacity involving the *-m* morpheme arises in cases in which the epenthetic vowel appears after a velar consonant. Turkish has a phonological rule of *Velar Deletion* which deletes such consonants intervocally. So, for *ajak* ‘foot’, the first singular possessive form is *ajam*. In a theory

with ordered rules, this effect is analyzed with a derivation in which *Epenthesis* is ordered before *Velar Deletion*:

(5) Example: *ajak* ‘foot’; *-m* 1sPoss

<i>ajak-m</i>	Input
<i>ajak-ɪm</i>	<i>Epenthesis</i>
<i>aja-ɪm</i>	<i>Velar Deletion</i>

Putting to the side various ways in which surface-oriented theories could produce *ajam* over e.g. **ajam*, there is a general point here for the study of global interactions. The effect seen in (5) is one in which an epenthetic vowel appears in an environment in which it is not locally conditioned on the surface. The Localist theory accounts for this with ordering: the structural description for *Epenthesis* is found at an intermediate stage of the representation, so that the epenthetic vowel is, in the terms employed above, locally conditioned.

While this particular type of surface-unconditioned effect is difficult for OT, the broader point is that locally “unmotivated” effects are in principle not a problem for theories that espouse Globalism. As stressed above, one of the defining properties of such theories is the ease with which they dispense of the notion of *Local Conditioning Environment*. Thus, the fact that a “change” occurs in a way that does not seem locally motivated in surface forms is not problematic in general. Rather, the problems in the specific case of Turkish *Epenthesis* (and other cases like this) are the following. First, there are no obvious, phonologically natural factors in the surface form of the word that would produce the actual form (i.e., that would motivate epenthesis).¹ Second, by ordering *Epenthesis* before *Velar Deletion*, the serial theory provides an obvious solution to why the epenthetic vowel appears in spite of not being between consonants on the surface.

6.1.2 Over-/Under-application in Allomorphy?

Whatever solution is offered for “standard” opacities of the type discussed immediately above, the crucial point for present purposes is that theories with Global-MP predict *overapplication* and *underapplication* in allomorphic selection, in the same way that overapplication and underapplication are predicted in the phonology. This can be seen when the intuition behind standard OT treatments of overapplication in reduplication are extended to allomorphic interactions.

Recall that the general idea in Globalist theories is that what is relevant for surface phonological form is not whether a particular element is in a configuration that triggers a change. Instead, the change happens when the overall constraint ranking prefers the candidate with the change, even if the *Local Conditioning Environment* for the change is not found in the surface form. This type of reasoning is illustrated in (6), which shows McCarthy and Prince’s (1995) analysis of overapplication in Tagalog /paN-RED-pu:tul/, which surfaces as *pa-mu-mu:tul*. In this example, the stem-initial /p/ surfaces as /m/, even though it is not adjacent to the *paN-* affix that triggers nasalization. The analysis involves the interaction of three constraints: a Phonological Constraint that forces “mutation” of /p/ to /m/, a constraint requiring Base-Reduplicant identity, and the standard I-O Faithfulness constraint:

(6) McCarthy and Prince (1995) analysis

/paN-RED-pu:tul/	Phono-Constraint	B-R Identity	I-O Faithfulness
a. pam-pu-pu:tul	*!		
b.  pa-mu-mu:tul			*
c. pa-mu-pu:tul		*!	

The stem-initial /p/ surfaces as /m/ in the winning candidate because base-reduplicant identity outranks the faithfulness constraint that penalizes candidates with changes to the underlying form. Thus, even though the relevant /p/ is not in the Local Conditioning Environment associated with the /p/→/m/ mutation, it surfaces as /m/ because of the identity constraint. In this way, the global constraint ranking enforces a change that is not locally expected based on the surface form.

The general effect that is seen in this type of analysis can be called NON-LOCAL (NL) APPLICATION:²

- (7) NL-APPLICATION: An effect is found in a surface form even though the effect is not constrained to its (typical) *Local Conditioning Environment*, because the constraint system allows global forces to override local ones.

The particular example from Tagalog analyzed in (6) does not directly involve Globalism in the Global-MP sense. While it involves apparent “action at a distance”, in the way described in (7), it is not the same kind of allomorph selection that is studied throughout this book. However, the type of interaction that it shows can easily be formulated in a way that implicates Global-MP as well, to yield predictions about Phonologically Conditioned Allomorphy (PCA); this is the topic of the next section.

6.2 Allomorphy and NL-APPLICATION

“Standard” opacity effects are a subcase of NL-APPLICATION, i.e., the subset in which the serial theory would have the effect derive from local conditioning by an element at an intermediate stage of a derivation. While standard cases of opacity are congenial to Localist/Serialist theories, the general type of NL-APPLICATION allowed by Globalist theories— i.e, the general principle that global effects can trump local conditioning in ways that do not involve local interaction at intermediate stages— defines a range of cases that cannot be analyzed on a Localist approach. Identifying the properties of these cases is a crucial step in understanding the predictions of Globalism.

6.2.1 Turkish 3s Possessive

A case of allomorphic selection which illustrates the possibility of NL-APPLICATION is found in the 3s Turkish possessive morpheme (see Lewis 1967, Carstairs 1987, Kornfilt 1997, Aranovich et al. 2005, Paster 2006). This appears to be a relatively straightforward case of (C)V allomorphy, with *-sɪ* after vowels and *-ɪ* after consonants (vowel harmony also affects the vowel component; examples from Paster 2006):

- (8) Two allomorphs: *-ɪ* (after C); *-sɪ* (after V)
- a. *bedel-i* ‘its price’
 - ikiz-i* ‘its twin’
 - alet-i* ‘its tool’

- b. fire-si ‘its attrition’
- elma-sı ‘its apple’
- arı-sı ‘its bee’

The alternation between *-sı* and *-ı* interacts with the process of *Velar Deletion*, described above. Recall that this rule deletes velars intervocalically:³

$$(9) \text{ Velar Deletion: } k \longrightarrow \emptyset / V _ V$$

The 3s possessive allomorph *-ı* is inserted after /k/-final stems. This produces the environment for *Velar Deletion*, which then applies to yield forms that have hiatus, and that are opaque in terms of allomorph selection:

- (10) açlık ‘hunger’; açlı-ı ‘its hunger’
- bebek ‘baby’; bebe-i ‘its baby’
- gerdanlık ‘necklace’; gerdanlı-ı ‘its necklace’
- ekmek ‘bread’; ekme-i ‘its bread’

Assuming a Localist theory like the one in Part I of this book, then, and on the further assumption that the *-sı/-ı* alternation involves competition between two distinct allomorphs, Turkish has the VIs in (11):⁴

- (11) [poss] ↔ -sı/V__
- [poss] ↔ -ı/C__

After Vocabulary Insertion, *Velar Deletion* applies in the phonology.

For Optimality Theory, these facts present a general challenge, in the way that is typically the case with opacity. Whatever solutions might be proposed for this particular case, the Turkish 3s allomorphy– and some hypothetical variants of Turkish in particular– illustrate the predictions that Globalist frameworks make concerning NL-APPLICATION.

6.2.2 NL-Application: “Overriding” Local Concerns

Informally, Localist theories are incapable of accounting for “look ahead” conditioning, of the type in (12):

- (12) Insert affix *x* in a particular environment, unless doing so creates an undesirable representation due to the interaction with other phonological or morphological processes that occur later in the derivation.

In the terms employed above, a theory with NL-APPLICATION could easily derive such effects. They would not involve “look ahead”, obviously, but instead a constraint ranking in which the global system produces a result that looks surprising from the perspective of a theory in which computations are restricted to apply in Local Conditioning Environments.

Schematically, the specific manifestations of NL-APPLICATION that are expected by Globalism can be seen as types of overapplication:

- (13) a. ALLOMORPHIC OVERAPPLICATION: A locally “unconditioned” allomorph is inserted instead of the expected one, because when the whole word is taken into account, the net result is better.

Example (Turkish’): In the Turkish case above, *-sɪ* is inserted after velar-final stems, in order to avoid the hiatus created by *Velar Deletion*. This would yield e.g. *bebek-sɪ*. (Viewing this as allomorphic *underapplication* of the *-ɪ* allomorph amounts to the same thing.)

- b. ALLOMORPH-DRIVEN PHONOLOGICAL OVERAPPLICATION: Rather than inserting an “unexpected” allomorph to avoid a problem, it should also be possible to see the surface results of a phonological change, even though its environment for application is not met locally.

Example (Turkish’): In the Turkish case above, deleting the velar /k/ and inserting *-sɪ* to yield *bebe-sɪ*.

The specific analyses of the patterns in (13) can be sketched in a way that illustrates the basic point. Beginning with Turkish’ in (13a), if a constraint penalizing hiatus **HIATUS* is ranked higher than the **VKV* constraint that enforces velar deletion, then the *-sɪ/-ɪ* alternation could be analyzed directly as a case of Phonological Selection, where, exclusively with velars, the “local” effect that selects *-ɪ* with C-final hosts is overridden. This analysis is shown in (14), where (14i,ii) show the simple cases of allomorphy, and (14iii) the **HIATUS*-driven allomorphic overapplication effect:⁵

(14) Turkish’

(i)	fire-sɪ/-ɪ	*HIATUS	*VKV	MAX(C)	NOCODA
a.	☞ fire-sɪ				
b.	fire-ɪ	*!			
(ii)	bedel-sɪ/-ɪ	*HIATUS	*VKV	MAX(C)	NOCODA
a.	bedel-sɪ				*!
b.	☞ bedel-ɪ				
c.	bede-sɪ			*!	
(iii)	bebek-sɪ/-ɪ	*HIATUS	*VKV	MAX(C)	NOCODA
a.	☞ bebek-sɪ				*
b.	bebek-ɪ		*!		
c.	bebe-ɪ	*!		*	
d.	bebe-sɪ			*!	

In the analysis of Turkish’, the simple cases of allomorphy between *-sɪ* and *-ɪ* emerge from the interaction of the constraints **HIATUS* and *NOCODA*. The constraint *MAX(C)* prevents deletion of consonants, and rules out other conceivable surface forms like **bede-sɪ*. Because of the way that the constraint driving *Velar Deletion* **VKV* interacts with these constraints, the optimal candidate for velar-final stems is *bebek-sɪ*, with *-sɪ* instead of *-ɪ*. The net result of this constraint ranking is a version of Turkish in which *-sɪ* is optimal for velar-final stems, because this allomorph choice avoids both hiatus and intervocalic velars.⁶

The Turkish' example shows the insertion of what is, in effect, a locally unconditioned allomorph, as outlined in (13a). The Turkish'' (13b) type of case, in which a phonological process overapplies, is easy to formalize as well. In particular, it is also possible to rank the constraints so that *bebe-sI* is optimal:

(15) Turkish''

	bebek-sI/-I	*HIATUS	*VKV	NoCODA	MAX(C)
a.	bebek-sI			*!	
b.	bebek-I		*!		
c.	bebe-I	*!		*	
d.	☞bebe-sI				*

Naturally, the constraint rankings involved in either of the two hypothetical languages just considered would have to be motivated based on larger analyses of the language. At the same time, these two possible systems clarify the types of phenomena that would provide evidence for Globalism.

A Localist theory has some difficulties producing the hypothetical forms. The generalization for Turkish' is that *-I* is inserted after non-velar consonants, and *-sI* elsewhere. It is not clear that VIs could make reference to a phonologically unnatural class in this way. The VIs required would have to be those in (16):

- (16) [3s] ↔ -I/C[-vel] ^ ___
 [3s] ↔ -sI

Reference to an unnatural phonological environment (non-velar consonants) might be impossible, depending on how this part of the theory is configured.

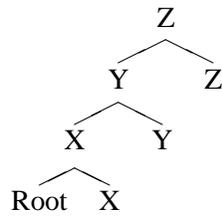
The situation with the *bebe-sI* example is similar, although slightly more is required of a Localist theory. The VIs in (16) could be employed to state the distribution of these exponents. In the case of velar-final stems, an additional (Readjustment) rule is required that deletes the stem-final velar in front of the *-sI* suffix.

6.2.3 A More Extreme (Hypothetical) Case

The examples from hypothetical Turkish might be salvageable on a Localist theory, in the way just indicated. The reason that some potential Localist analyses of these effects can be formulated is that allomorph choice can still be made on the basis of something that is locally visible to the 3s possessive morpheme. But it is also possible to construct examples in which the factors forcing allomorph selection are not adjacent to the morpheme in question. This kind of effect is easy to formulate in a Globalist theory, but goes beyond what a Localist theory can express.

One type of example along these lines has an additional morpheme intervening between two other morphemes that show allomorphy. Consider, for example, a language in which Roots may be followed by three morphemes, *-X*, *-Y*, *-Z*, where these have the allomorphs listed:

(17) Structure



(18) Root-X-Y-Z

- a. X: -tak; -ilub
- b. Y: -o
- c. Z:
 - i. Z1: -bat
 - ii. Z2: -tarag

In the simple cases— i.e., in examples where -Y and -Z are null or not present— the -X morpheme shows PCA based on the metrical properties of the host:

- (19) -tak after odd-syllabled host
-ilub after even-syllabled host

Suppose further that the Z morpheme is not subject to contextual allomorphy at all, so that, for example, Z1 -bat and Z2 -tarag are associated with different feature combinations.⁷

With global interaction, it is possible to set things up so that the allomorph of the -X morpheme *vacillates* depending on what is inserted into the outer and non-adjacent Z morpheme. Beginning with the simple cases with only -X, it can be hypothesized that a PARSE- σ constraint favoring even-numbered words accounts for the pattern of allomorph selection shown by -X (footing shown):

- (20) Root-X cases; Roots = blik, golut
- a. (blik-tak)
*(blik-i)lub (violates PARSE- σ)
 - b. *(golut)-tak (violates PARSE- σ)
(golu)(t-ilub)

In the more complex structures, with the additional -Y and -Z morphemes, what is optimal at -X depends on which morpheme appears in the outer and non-adjacent -Z position. This is illustrated in (21), where foot boundaries are again shown for expository purposes; the two subcases show how -X varies depending on whether -bat or tarag is inserted at -Z:

- (21) a. i. blik-X-o-bat: -tak inserted at -X

*(blik-i)(lub-o)-bat
(blik-ta)(k-o-bat)
- ii. blik-X-o-tarag: -ilub inserted at -X

(blik-i)(lub-o)-(tarag)
*(blik-ta)(k-o-ta)rag
- b. i. golut-X-o-bat: -ilub inserted at -X

(golu)(t-ilu)(b-o-bat)
*(golut-)(tak-o)-bat

ii. golut-X-o-tarag: *-tak* inserted at -X

*(golu)(t-ilu)(b-o-ta)rag
(golut)-(tak-o)-(tarag)

Clearly the way that these examples work involves global considerations. The superficially “local” requirement that *-tak* appear after odd- and *-ilub* after even-syllabled hosts is overridden by the global pressure exerted by the phonology of *-Z*’s exponent. The (output) phonology determines the morphology of allomorph selection, and the properties of the whole word have to be visible simultaneously for this to be done properly.

In a Localist theory, this effect cannot be derived. In the theory of Chapter 2, there are two reasons for this. The first is that an inner morpheme cannot be sensitive to the phonology of an outer morpheme, by the assumption of cyclic or “outwards” VI. The second reason is that the -X morpheme is not adjacent to the *-Z* morpheme, and therefore could not see it for allomorphic purposes. The most that could be stated is the part of the distribution that is seen in the “basic” cases, where *-ilub* is inserted for *-X* next to a foot boundary:

(22) [X] ↔ *-ilub* / ...] [^] ___
[X] ↔ *-tak*

This analysis predicts that *-X*’s allomorphy should depend only on the metrical properties of what is to its left, whatever form *-Z* may ultimately take. It is incapable of stating the pattern described above.

There are two points to be made about the kind of example examined in this section. The first is that cases of this type would be a clear argument in favor of a Globalist theory. The second is that there does not appear to be any evidence that this type of effect is found in any language; in actual cases where something like this hypothetical scenario could be found, the facts are those expected in the Localist model, and show no evidence for Global computation.

6.2.4 Local and Cyclic Interactions

The literature has to a limited extent addressed predictions of Globalist theories along the lines schematized above. In one type of case, the point has been made that a Localist or cyclic theory makes the correct predictions. Some shorter cases of this type are reviewed in the next subsections, followed by some comments on Cyclic Optimality Theory in 6.2.5. Another type of case involves explicit arguments for surface phonology determining allomorph selection. In 6.3 below, I examine in greater detail arguments along these lines from Mester 1994 for global allomorph selection in Latin. It is shown that when the relevant facts are analyzed in detail, the argument for Global interaction collapses.

6.2.4.1 Affix Placement in Huave

An early clarification of the predictions of Globalism is made by Noyer (1993), which discusses the behavior of “mobile” affixes in the language Huave. Some affixes in this language, like *-t-* past tense, attach to an element that is analyzed as a Theme vowel. The theme vowel is sometimes a prefix, sometimes a suffix, in ways that correlate with transitivity: the theme is a prefix with

transitive verbs, and a suffix with intransitive verbs. The set of affixes to which *-t-* belongs attach to the theme in either case, i.e., whether the theme is a prefix or a suffix:

- (23) a. *t-a-wit'*
 PAST-TH-raise
 'He/she raised (it)'
- b. *wit'-i-t*
 raise-TH-PAST
 'He/she rose up.'

Affixes like *-t-* are “mobile” in the sense that they may occur either as prefixes or as suffixes.⁸

Noyer explores the possibility that this distribution results from the requirement that Huave words must have final codas. This is a version of Phonological Selection in which output phonology determines not allomorphy, but the placement of morphemes in a word.

On the assumption that the theme vowel's status as a prefix or a suffix depends on morphosyntactic factors, the phonology determines the placement of the “mobile” affix. Specifically, candidates like *t-a-wit'* and *a-wit'-t* and *t-wit'-a* and *wit'-a-t* are considered for the prefixal and suffixal theme cases respectively. The constraint system selects the candidates that meet the phonological condition requiring final codas.

Noyer goes on to discuss a further set of examples that implicate the questions about Globalism raised above. In some forms, the mobile affixes can occur inside of other affixes; this is seen in (24a) for past tense *-t-*, and in (24b) for 1s *-n-*, which is also mobile:

- (24) a. *wit' -i -t -as -on*
 raise -TH -PAST -1 -AUG
 'We-INCL rose'
- b. *sa- wit' -i -n -on*
 (1)FUT- raise -TH -1 -AUG
 'We-EXCL will rise'

As Noyer points out, if the whole word were evaluated in these types of cases, there is no reason for the mobile affixes to appear where they do. As far as the condition on final codas is concerned, the 1s *-n-* morpheme in (24b) could be realized as a prefix, as in **sa-n-wit'-i-on*. The solution that Noyer offers is that evaluation of well-formedness occurs cyclically. In the case of e.g. (24b), this means that when the placement of *-n-* is determined, “outer” suffixes are not present in the computation.

Examples of this type are important; they are cases in which the strong predictions of Globalism could conceivably be manifested, but, instead, what is found is what is expected from a cyclic point of view. A fully global theory predicts that there should be interactions that do not show this kind of cyclic effect; i.e., where the full Globality discussed in the preceding sections is required. In such a theory it is possible to model this type of interaction, either indirectly, or directly (in the latter case, by assuming cyclic or stratal OT; see below 6.2.5); however, placing restraints on the theory in this way is not an argument for Globalism

6.2.4.2 Saami

Moving past affix placement to allomorph selection, the literature provides additional cases in which global considerations allow for a type of allomorph selection that is not possible in the Localist view, and, once again, the Globalist theory must be “restrained” to produce the correct results, i.e., to exclude other cases that might be expected to arise.

The sensitivity of various allomorphs in Saami (Lappish) to metrical structure is addressed in Dolbey 1996 and Orgun and Dolbey 2007 (see in addition Hargus 1993 and Bergsland 1976), which discuss the interaction of cyclic and local factors versus global optimization in Saami verbs. The allomorphy in question appears to be phonologically optimizing in the sense that it yields surface forms that contain an even number of syllables; the examples here are drawn from the person/number system, along with a passive morpheme:

(25) Person-marking/passive allomorphy

a. Allomorphs by host syllable count

P/N	Even	Odd
1du	-Ø	-tne
2du	-beahtti	-hppi
2pl	-behtet	-hpet
3pl pret	-Ø	-dje
passive	-juvvo	-vvo

b. Examples: *jearra* ‘ask’; *veahkehea* ‘help’

1du	je:r.re.-Ø	veah.ke.he:-t.ne
2du	je:ar.ra.-beaht.ti	veah.ke.he:ha-hp.pi
2pl	je:ar.ra.-beh.tet	veah.ke.he:-h.pet
3pl pret	je:r.re.-Ø	veah.ke.he:-d.je
passive	je:r.ro.-juv.vo	veah.ke.hu-v.vo

From the perspective of the phonology, this pattern of allomorphy creates even-syllabled forms that can be exhaustively parsed into binary feet.

Dolbey (1996) makes the point that the evaluation that results in this distribution appears to be local rather than global in character. In cases in which more than one of these affixes is added to a host, there is more than one possible outcome that optimizes the syllable count. Thus, for example, with a passive 2du, adding two monosyllabic affixes results in an even syllable count, just as adding two disyllabic affixes does. A Localist theory predicts that the disyllabic affix must be inserted in the inner morpheme position, since this is what the local context demands; following this, the local environment forces selection of another disyllabic affix.

The facts show that in the cases in question, two disyllabic affixes are selected:⁹

- (26) je:r.ro.-juvvo-beahti; *je:rru.-vvo-hppi
veahkehu.-vvo-beahtti; *veahkehu.-juvvo-hppi

Again, this is the type of situation in which the strong predictions of Globalism could be manifested. If in the cases where two metrically-conditioned allomorphs were found, there were two monosyllables inserted, the putative phonological “target” of allomorph selection— exhaustively

parseable structures– would be achieved; and it would be achieved in a way that could not be stated in the Localist theory, where look-ahead to outputs is impossible. Instead, however, the interaction appears to be local, in a way that falls naturally out of the Localist theory. It is, of course, possible to state such a pattern in a globalist theory, but that is not at issue. Rather, the point is that a case in which the strong predictions of Globalism *could* conceivably be found functions in terms that are analyzable in the more restrictive Localist architecture.

6.2.5 Some Comments on Cyclic OT

The idea that local concerns trump global ones is, in some sense, the motivation for cyclicity. Some theories have sought to restrain the Globalist architecture by proposing that constraint evaluation is cyclic, in the sense familiar from Lexical Phonology; see e.g. Kiparsky 2000 and subsequent work.

It is important to note that while cyclic OT is able in principle to account for (at least some of) the cases examined above, it still makes predictions that are very different from a Localist theory. In particular, a cyclic OT theory is still Globalist *within any given stratum of affixation*. While this type of theory restrains predictions about allomorphy in comparison with a fully Globalist model, there appears to be no evidence for this limited amount of global interaction between morphology and phonology.

The specific predictions made by a stratal or cyclic OT model depend on how cycles of affixation are defined. The primary point to be made is that, in any theory that allows three morphemes to have their morphology and phonology computed in the same cycle, NON-LOCAL APPLICATION is predicted. This point is schematized in (27):

(27) Root-*X*-*Y*-*Z*

If the heads *X*, *Y*, and *Z* are processed in the same cycle (perhaps in a way that excludes other, outer heads), the theory predicts that allomorph insertion at *X* could be sensitive to the phonology of *Z*, or the phonology of the whole object containing *Z*. These types of effects are not statable in the Localist theory; but they do not seem to be found. Other effects, such as those involving the phonological form of two morphemes, as in the Saami example above, would also be predicted to show global behavior as long as the two morphemes are in the same stratum. Again, there is no clear evidence that this kind of limited global interaction is attested.

Thus, while appealing to serial or cyclic OT might rule out some of the (unattested) cases predicted by a fully Globalist model, it makes predictions about morphology/phonology interactions that are evidently not found.

6.2.6 Interim Assessment

A number of cases, both hypothetical and real, were examined above as ways of seeing the predictions of Globalist theories. A basic point where Globalism and Localism differ is that the former type of theory predicts allomorphic effects in PCA that are locally unconditioned, but which make sense when the global, surface phonology is taken into account.

There appears to be no clear evidence that interactions of this type are found in natural languages. In the cases that have been studied, selection appears to proceed step-by-step, in a way that is expected from the point of view of a cyclic Localist theory.

The same points are made by a more detailed examination of certain patterns of allomorphy in Latin verbs, to which I now turn.

6.3 Case Study: Arguments for Global Optimization in Latin

The predictions of globalist theories can be seen quite clearly in two case studies from Latin, drawn from Mester 1994. Each of these cases involves the distribution of allomorphs in the verbal system: perfect *-u* versus *-s* in conjugation II verbs, and theme vowel *-ī-* versus *-i-* in the so-called *io*-verbs. In each of these cases, standard handbooks of Latin allude to metrical patterns that correlate with the allomorphic patterns. Whatever status these claims might have within Latin historical phonology and morphology, Mester goes one step further than this, by arguing that the distribution of allomorphs in the synchronic grammar of Classical Latin requires a Globalist framework in which selection of (certain) host-allomorph combinations is computed by generating all of the relevant combinations and letting the phonology determine the winner.

Closer examination of both cases shows that Mester’s arguments for Globalism fail to provide any convincing evidence for such a framework. The proposals do not apply to more than a carefully-selected set of forms, and make incorrect predictions when extended beyond these. The two cases do, however, pave the way for discussion of a further strong prediction of Globalism, which was called ALLOMORPHIC VACILLATION above: a “switch” in the selected allomorph for a particular root, based on (phonological) properties of outer morphemes. This strong prediction is not borne out in Latin, nor, to my knowledge, is it manifested elsewhere.

Part of this section is thus devoted to a negative demonstration. In addition, though, there are important patterns to attend to in these cases— in perfect formation in particular— and these patterns show the kind of locality effect discussed in 6.2.

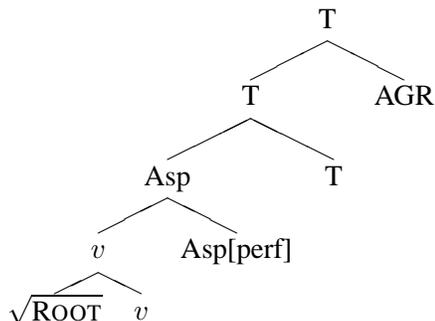
6.3.1 Latin Perfect Allomorphy in the Second conjugation

Mester’s (1994) influential discussion of the perfect forms of (some) Latin verbs is often cited in the literature as an example in which global prosodic considerations play a decisive role in allomorph selection.

Second conjugation Latin verbs show the theme vowel *-ē-* in the present tense system: thus we find infinitives like *mon-ē-re* ‘to warn’, *aug-ē-re* ‘to increase, enlarge’, and so on. The argument that Mester makes for phonology determining allomorphy is based on the perfect forms of (some) verbs from this conjugation.

Throughout the Latin verbal system, the perfect tenses show a great deal of allomorphy. I will assume here that, in addition to stem changes, what is at issue is the allomorphy of the aspectual head Asp[perf]; recall the discussion of §3.1.1, where the following structure is assumed:

(28) Structure:



The Asp[perf] head in finite forms shows different allomorphs, including the vowel *-u-* (a glide intervocalically, often written *-v-*), *-s-*, and *-Ø-* (1s citation form employed here):¹⁰

- (29) a. Conjugation I *laud-ā-re* ‘praise’, Perf. *laud-ā-v-ī*
 b. Conjugation II *mon-ē-re* ‘warn’, Perf. *mon-u-ī*
 c. Conjugation II *aug-ē-re* ‘increase’, Perf. *aug-s-ī*
 d. Conjugation II *strīd-ē-re* ‘whistle’, Perf. *strīd-Ø-ī*

The case that Mester concentrates on is in the second conjugation, where the distribution of *-u-* and *-s-* in the (29b-c) types is, according to the traditional literature (see Meiser 2003 for a recent overview), correlated with metrical factors: light stems take *-u-*, and heavy stems *-s-*.¹¹

Whether or not the prosodic correlations connected with this pattern of allomorphy are descriptively accurate, the interesting point for present purposes is how Mester accounts for this effect in terms of competition in the synchronic grammar of Classical Latin. Mester’s primary focus is on sets of effects correlated with *trapping* configurations; more precisely, instances of *medial* trapping, where an unparsed light syllable appears after footed material:¹²

- (30) Medial trapping: ...[$\bar{\sigma}$]σ̣⟨ $\bar{\sigma}$ ⟩

This sort of configuration arises in a moraic theory where trochees are both minimally and maximally bimoraic.¹³ The essential idea behind Mester’s proposal is that it is the avoidance of medial trapping that determines the choice between *-u-* and *-s-*. This means that for any given verb of the type under consideration (i.e. 2nd conjugation with *-u-* or *-s-* perfect), the input, consisting of a Root and a perfect morpheme, is associated with candidates with different allomorphs; thus for *monēre*, *mon-u-ī* is competing with (among other things) *mon-s-ī*. The constraint or constraints that disfavor medial trapping or its equivalent (i.e. a trimoraic trochee) do the rest, effectively selecting one allomorph and rejecting the other:

- (31) a. [monu]⟨ $\bar{\imath}$ ⟩
 b. *[au]gu⟨ $\bar{\imath}$ ⟩ (trapping)
 [aug]⟨ $\bar{\imath}$ ⟩

Mester does not formalize the competition, but explains the intuition guiding his analysis by remarking that “...a lexical selection process...is driven by a prosodic criterion choosing the best among several alternatives.” (1994:46). The *u*-perfect is given “default” status, appearing where selection plays no role; for Mester, this is the case with verbs that he classifies as denominal, which appear with the *u*-perfect without regard to Root phonology.

To this point, the proposal looks exactly like many of the cases discussed above. When we consider entire sets of inflected perfects, however, it is possible to see the strongest predictions of the globalist view. Consider, to begin with, the two types of verbs considered above, inflected for the perfect indicative; for reference, the syllable structure of the output is presented:

- (32) Types: Perfect Indicative Active

P/N	Light Root	Syll.	Heavy Root	Syll.
1s	monuī	[ǫǫ]⟨ō̄⟩	augṣī	[ō̄]⟨ō̄⟩
2s	monuistī	[ǫǫ][ō̄]⟨ō̄⟩	augṣistī	[ō̄][ō̄]⟨ō̄⟩
3s	monuit	[ǫǫ]⟨ō̄⟩	augṣit	[ō̄]⟨ō̄⟩
1pl	monuimus	ǫ[ǫǫ]⟨ō̄⟩	augṣimus	[ō̄]ǫ⟨ō̄⟩
2pl	monuistis	[ǫǫ][ō̄]⟨ō̄⟩	augṣistis	[ō̄][ō̄]⟨ō̄⟩
3pl	monuērunt	[ǫǫ][ō̄]⟨ō̄⟩	augṣērunt	[ō̄][ō̄]⟨ō̄⟩
3pl	monuerunt	ǫ[ǫǫ]⟨ō̄⟩	augserunt	[ō̄]ǫ⟨ō̄⟩
3pl	monuēre	[ǫǫ][ō̄]⟨ō̄⟩	augṣēre	[ō̄][ō̄]⟨ō̄⟩

The crucial form to consider in (32) is the 1pl of the heavy verb *augēre*.¹⁴ This appears with the *-s*-perfect, which, in combination with the 1pl agreement morpheme, results in the configuration with medial trapping [ō̄]ǫ⟨ō̄⟩. This point is crucial because of the competition logic that underlies the optimization approach to allomorphic selection. Within this kind of theory, the “medial trapping” perfect with *-s* is generated and compared with other possible perfects. The *-u*- perfect for *augēre*, *auguimus*, has the metrical structure $\bar{\sigma}\bar{\sigma}\bar{\sigma}\bar{\sigma}$, and, according to Mester’s assumptions, can be exhaustively parsed: [ō̄][ǫǫ]⟨ō̄⟩. Thus, if prosodic well-formedness is really the driving factor in selecting allomorphs, **auguimus* should be grammatical, contrary to fact.

It would always be possible to appeal to the force of other constraints to account for the presence of *-s*, by appealing to e.g. UNIFORM EXPONENCE, as in Kenstowicz 1996 and related work. Such constraints enforce identical allomorphy across the different forms. However an analysis in these terms might be implemented, this type of solution subverts the strongest predictions of the Globalist approach. Since the Globalist theory allows for the entire word’s phonological properties to be taken into account in determining a winner of the competition, it—unlike the Localist theory—predicts that there should be cases of suppletive allomorphy that show ALLOMORPHIC VACILLATION, where the chosen allomorph depends on outer, global properties. There is no vacillation, and the pattern found with Latin *augēre* is clearly compatible with the Localist theory; it can, of course, be made compatible with the Globalist theory, but provides no arguments for that (more expressive) view.¹⁵

The failure of the strong prediction is not restricted to 1pl perfects. The same point can be made in the pluperfect Indicative, with a lot more force, it appears:

(33) Pluperfect Indicative of *augēre*

P/N	Pluperfect	Syll.	<i>u</i> -form	Syll.
1s	augseram	[ō̄]ǫ⟨ō̄⟩	augueram	[ō̄][ǫǫ]⟨ō̄⟩
2s	augserās	[ō̄]ǫ⟨ō̄⟩	auguerās	[ō̄][ǫǫ]⟨ō̄⟩
3s	augserat	[ō̄]ǫ⟨ō̄⟩	auguerat	[ō̄][ǫǫ]⟨ō̄⟩
1pl	augserāmus	[ō̄]ǫ[ō̄]⟨ō̄⟩	auguerāmus	[ō̄][ǫǫ][ō̄]⟨ō̄⟩
2pl	augserātis	[ō̄]ǫ[ō̄]⟨ō̄⟩	auguerātis	[ō̄][ǫǫ][ō̄]⟨ō̄⟩
3pl	augserant	[ō̄]ǫ⟨ō̄⟩	auguerant	[ō̄][ǫǫ]⟨ō̄⟩

In the perfect indicatives in (32), selection of the *-s*-allomorph avoids medial trapping for heavy verbs like *augēre*, except in the 1pl. In the pluperfect, the selection of the *-s*- allomorph creates trapping configurations in the entire paradigm of inflected forms. Crucially, these trapping configurations are not created by the *u*-perfect, where the light syllable with *-u*- can be footed across the board. If all the different host plus allomorph combinations were generated, with the phonology selecting the winner on the basis of metrical felicity— i.e., if the strong predictions of Mester’s theory

were correct— this pattern would not be found; pluperfects with these stems should show *-u-*.

In sum, something must be added to a Globalist theory in order to make prosodic optimization to the determining factor for allomorphy in only some contexts. It should be clear by this point that such an addition would not compromise such a theory directly. As already noted above, it is clear that it would be possible to posit additional constraints to ensure that *augsimus* wins the competition; e.g., a constraint holding that allomorphy be held constant for a particular root could be ranked above the constraints that enforce prosodic well-formedness.¹⁶ This would penalize **auguimus* for taking a different allomorph from the rest of the paradigm, so that the prosodically worse *augsimus* would then win. The fact that the global theory can be altered in this or other ways to yield the correct output is not really what is at issue, however. If there were cases in which something like *auguimus* did surface because of global prosodic considerations, then it would be a clear argument in favor of the kind of globalist system. As with other examples we have seen above, it is quite clear exactly what sort of effect in the Latin case would be a strong argument for globalism, and we do not see such effects.

6.3.2 Generalizations about Latin Perfect Allomorphy

While the prospects for a globalist approach to Latin perfect Allomorphy look particularly unpromising, there are important generalizations about this system that relate directly to themes developed throughout this monograph.¹⁷ As a first step, consider the classification of Latin verbs in (34), which divides the verbal system into conjugation classes, and shows the theme vowel that is found in each class:¹⁸

(34) conjugations and Theme Vowels

conjugation	Example	Theme Vowel
I	laud-ā-mus	-ā-
II	mon-ē-mus	-ē-
III	dūc-i-mus	-i-
III(i)	cap-i-mus	-i-
IV	aud-ī-mus	-ī-
Athematic	es-∅-se	-∅-

It will be assumed here that the theme vowel is the spell-out of a head TH, attached to the *v* head in the PF component (Oltra-Massuet 1999). The reason for approaching the perfect in terms of conjugation is that there are basic associations between conjugation class and what happens in the perfect. Putting aside various readjustments that apply to the stem, there are two pieces of information that are central to these patterns: first, whether or not there is a theme vowel in the perfect form; and second, what allomorph of the head Asp[perf]— *-vi-*, *-si-*, *-i* appears (recall also the discussion of Chapter 3). The basic associations between conjugation and perfect type are as follows (here and below I use orthographic *-v-* in the exponent of Asp[perf] that has both vowel and glide surface forms):

(35) Perfect Type by conjugation: Basic Associations

conjugation I:	Thematic with -vi-
conjugation II:	Athematic with -vi-
conjugation III:	Athematic
conjugation III(i):	Athematic
conjugation IV:	Thematic with -vi-

The associations are “basic” in the sense that most verbs in the relevant conjugations behave accordingly. At the same time, there are departures from these norms. The following chart summarizes attested patterns:¹⁹

(36) Perfect Types by conjugation

	Conj.	Verb	Perfect	Trans.	Theme?	Exponent
a.	I	laudāre	laud-ā-v-ī	‘praise’	Thematic	+ -vi-
b.	I	crepāre	crep-v-ī	‘rattle’	Athematic	+ -vi-
c.	I	iuvāre	iūv-ī	‘help’	Athematic	+ -i-
d.	II	monēre	mon-v-ī	‘warn’	Athematic	+ -vi-
e.	II	sedēre	sēd-ī	‘sit’	Athematic	+ -i-
f.	II	manēre	man-s-ī	‘remain’	Athematic	+ -si-
g.	III	vomere	vom-v-ī	‘vomit’	Athematic	+ -vi-
h.	III	vertere	vert-ī	‘turn’	Athematic	+ -i-
i.	III	dūcere	dūc-s-ī	‘lead’	Athematic	+ -si-
j.	III(i)	rapere	rap-v-ī	‘seize’	Athematic	+ -vi-
k.	III(i)	capere	cēp-ī	‘take’	Athematic	+ -i-
l.	III(i)	-spicere	spec-s-ī	‘peer’	Athematic	+ -si-
m.	IV	audīre	aud-ī-v-ī	‘hear’	Thematic	+ -vi-
n.	IV	aperīre	aper-v-ī	‘open’	Athematic	+ -vi-
o.	IV	venīre	vēn-ī	‘come’	Athematic	+ -i-
p.	IV	farcīre	far-s-ī	‘stuff’	Athematic	+ -si-

Despite the large number of filled cells in this chart, which suggests a highly disorderly pattern, the formation of the perfect is, by and large, determined systematically by conjugation class.²⁰ My analysis of these patterns builds directly on the idea that aspects of perfect formation, in particular whether or not a Root is thematic or athematic in the perfect, is correlated directly with conjugation class features. In particular, all verbs of conjugations II, III, and III(i) are athematic in the perfect, along with a handful of verbs from conjugations I and IV. For concreteness, I assume that there is a rule that deletes (or does not assign) the TH node to such verbs in the perfect:

(37) Athematic Perfect Rule

$$v \text{ is athematic/} \left\{ \begin{array}{l} [\text{II}] \\ [\text{III}] \\ [\text{III(i)}] \\ \text{LIST} \end{array} \right\} \text{ — Asp[perf]}$$

$$\text{LIST} = \{\sqrt{\text{CREP}}, \sqrt{\text{VEN}}, \dots\}$$

Simply listing the conjugation features in this manner might seem arbitrary, but it is more or less necessary. There is no overarching generalization that unites the verbs of conjugations II, III, and III(i). There is, moreover, no generalization that unifies conjugations I and IV, those conjugations

that are by default thematic in the perfect. This means that the information regarding the presence or absence of a theme in the perfect must be stated in terms of processes that refer to the conjugation features [II], [III], and [III(i)], along with the additional Roots from the other conjugations.

The presence or absence of a theme vowel interacts with the second aspect of perfect formation, the allomorphy of the head Asp[perf]. Here the generalizations are as follows:

- (38) Generalizations about Perfect Formation
- a. Perfects with *-si-* are always athematic
 - b. Perfects with *-i-* are always athematic
 - c. If there is a Theme Vowel in the perfect, it is
 - i. Always long (i.e. \bar{a} - or \bar{i} -);
 - ii. Always followed by the *-vi-* exponent of Asp[perf]

These generalizations are accounted for with the following Vocabulary Items:

- (39) a. Asp \leftrightarrow *-si* / { $\sqrt{\text{MAN}}$, $\sqrt{\text{DŪC}}$, $\sqrt{\text{FARC}}$, ...} $\hat{\text{---}}$
 Asp \leftrightarrow *-i* / { $\sqrt{\text{SED}}$, $\sqrt{\text{VERT}}$, $\sqrt{\text{CAP}}$, $\sqrt{\text{VEN}}$...} $\hat{\text{---}}$
 Asp \leftrightarrow *-vi*

In these Vocabulary Items, *-si* and *-i* require particular Roots to be inserted. Significantly, the rules for inserting these exponents only apply when the ASP[perf] node is linearly adjacent to the Root. In this way, the insertion of these exponents can only take place in athematic forms. Beyond this, the system defaults to the insertion of *-vi*. This Vocabulary Item does not have a list associated with it. It will be inserted in environments in which (1) the Root is adjacent, but not on the list for either *-si* or *-i* (athematic formation), or (2) in cases in which the Root is followed by a theme vowel— i.e. either \bar{a} - or \bar{i} -.

In short, there are important generalizations about allomorphy in the perfect: generalizations that take into account local relations, in the way predicted by the theory of Part I.

6.3.3 Latin Verbs of conjugations III/III(i)/IV

A long-standing question in Latin morphology and phonology concerns the behavior of two classes of verbs in the language which, because they have 1s forms that end in *-iō*, are often simply referred to as *-iō*-verbs. The notable property of these verbs is that they fall into two types: those with a short theme vowel, like *capimus* ‘take, etc.’, and those that have a long \bar{i} -, like *audimus* ‘hear’; I use 1pl forms here because in some other forms there are morphophonological rules that obscure this basic pattern. The *capimus* class— henceforth conjugation III(i)— is quite small, consisting of fewer than twenty verbs, while the \bar{i} -class— conjugation IV— is very large.

The traditional literature has faced in many forms the question of how these classes are related to one another, since there are clear diachronic connections. The typical approach is to try to derive the verbs of conjugation III(i) from what were earlier conjugation IV verbs; i.e., to account for theme-vowel shortening with a subset of conjugation IV verbs, in a way that eventually became “morphologized”.

One of the points often discussed in the context of such accounts is that there is a phonological subregularity unifying the verbs of III(i): their stems are light. This correlation is potentially

enlightening, and many traditional works have sought to derive *-ī*-shortening as a metrical effect, to varying degrees of success.²¹

The traditional accounts mentioned above are interested in the historical relationship between these classes of verbs. Mester's analysis goes beyond the historical and pushes the quantity differences in the theme vowel into the synchronic grammar; his position is that the III(i) and IV groups show "underlying unity", because "...for primary verbs the quantity of the theme vowel is to a large extent predictable from the prosodic pattern of the root" (1994:24). The unified approach is implemented with a "single" theme vowel at a morphological level; this single morphological object has two allomorphs (1994:26):

- (40) Theme vowel /i/:
- a. primary allomorph: *-ī*-
 - b. secondary allomorph: *-ĭ*-

For verbs that belong to either conjugations III(i) or IV (minus certain exceptions, e.g. those that are not denominal), there is prosodic selection: "...the secondary allomorph *-ĭ*- is chosen...in situations where short quantity results in more optimal prosodic organization" (1994:26-7). Mester illustrates the effects of this selection along the lines of (41), for *audīre* 'hear', *aperīre* 'uncover', and *capere* 'take':

- (41) Host-allomorph selection by phonology:

<i>-ī</i> -	$[\bar{\sigma}][\bar{\sigma}]\langle\sigma\rangle$ [au][dī]⟨mus⟩ audīmus	$[\check{\sigma}\check{\sigma}][\bar{\sigma}]\langle\sigma\rangle$ [ape][rī]⟨mus⟩ aperīmus	$\check{\sigma}[\bar{\sigma}]\langle\sigma\rangle$ ca[pī]⟨mus⟩ *capīmus
<i>-ĭ</i> -	$[\bar{\sigma}]\check{\sigma}\langle\sigma\rangle$ [au]dĭ⟨mus⟩ *audĭmus	$\check{\sigma}[\check{\sigma}\check{\sigma}]\langle\sigma\rangle$ a[peĭ]⟨mus⟩ *apeĭmus	$[\check{\sigma}\check{\sigma}]\langle\sigma\rangle$ [capĭ]⟨mus⟩ capĭmus

Mester seeks additional evidence for prosodic selection elsewhere in the verbal system; in particular, in effects found with unprefixed and prefixed verbs, where, in the cases he discusses, there appears to be an alternation in theme vowel length (1994:27-8). These cases are important in light of the discussion above, since, if one adopts the spirit of the proposal under consideration, changes in a theme vowel's quantity driven by the addition of a prefix could constitute an instance of ALLOMORPHIC VACILLATION:

- (42) Prefixation

	(No Prefix)	(Light Prefix)	(Heavy Prefix)
a.	$[\check{\sigma}\check{\sigma}]\langle\sigma\rangle$ <i>-ĭ</i> - parĭmus sapĭmus	b.	$[\check{\sigma}\check{\sigma}][\bar{\sigma}]\langle\sigma\rangle$ <i>-ī</i> - re-perīmus re-sipīmus
		c.	$[\bar{\sigma}][\check{\sigma}\check{\sigma}]\langle\sigma\rangle$ <i>-ĭ</i> - dē-sipĭmus

Taking the proposal as a whole, there are different ways to approach its predictions. One of the basic tenets of the theory is that the *-ī*-theme of conjugation IV verbs appears because of syllabic optimization. One place to look for predictions of this theory is parallel to what was done in the perfect case above. In other forms of the same verb, the theory predicts ALLOMORPHIC VACILLATION

depending on the phonology of outer morphemes (e.g. Tense and Agreement). Here there are fewer cases than there were with conjugation II perfect allomorphy, but there is at least one case where a prediction is made. The 2pl passive, because the passive agreement ending is disyllabic, provides one such case: this is shown with long and short i-vowels in (43):

(43) 2pl Present Indicative Passives

- a. audī-minī [ō][ō]ŏ⟨σ⟩
- b. audī-minī [ō][ōŏ]⟨σ⟩

Clearly (43b) form should be selected, because the (43a) form traps a light syllable. Again, though, this is not what is found; as with perfect allomorphy, there is no vacillation.

An extension of this type of prediction that is behind Mester's take on the prefixed verbs in (42). The idea is that the verb forms differ only in the quantity of the prefix, and, when this can result in suboptimal footing as in the (b) examples, the -ī- allomorph wins out over the expected -i- theme. The general prediction that is at issue here is as follows:²²

(44) OPTIMIZATION PREDICTION: Verbs of conjugation III(i) when prefixed by a single light syllable should switch to the -ī- theme.

Rationale: [ōŏ][ō]⟨σ⟩ is better than ŏ[ōŏ]⟨σ⟩

While this prediction is supposed to account for pairs like those found in (42), it does not generalize. For many of the III(i) verbs, there are examples with the light prefix *re-* employed in (42) above; none of these show the predicted change in theme vowel:

(45) *re*-Prefixed verbs with -i-

capīmus	'take, etc.'	re-cipīmus	'retake'
facīmus	'make, etc.'	re-ficīmus	'make again'
fodīmus	'dig'	re-fodīmus	'dig again'
gradīmur	'step, walk'	re-gredīmur	'go/come back'

In these verbs, the theme vowel is the same in the unprefixed and the prefixed forms. While there are many things going on in Latin prefixed verbs, the prediction in (44) is not borne out.

What, then, can be said about the cases adduced by Mester in (42)?

The triplet *sap-ī-mus*, *re-sip-ī-mus*, *dē-sip-ī-mus* from (42) is taken by Mester to be "particularly telling", since the same root is involved (historically, in any case). Here the facts are simply unclear, for the *re*-prefixed form in particular. Lewis and Short's Latin dictionary shows an infinitive in *-ēre*, which means that it is treated as a verb of conjugation III(i). For the -ī-theme that his argument is based on, Mester cites Niedermann 1908. Niedermann has the form in a footnote, where it is shown to be drawn from the post-classical grammarian Charisius; there is, moreover, apparently a text of Charisius in which the vowel is short. As far as I know, there is no other evidence than this for a long-vowel form.

This leaves the verb *reperīre* 'find, discern', which is (at a minimum, historically) related to III(i) *parere*, and shows the -ī- theme expected on Mester's account. Given the facts adduced above, this single form is certainly not evidence in favor of the globalist theory. The putative base of this prefixed form, *parere*, means 'bear, beget'. It is possible that in spite of the historical connection,

speakers did not analyze these forms as possessing the same Root.²³ Whatever there is to say about this single case, the point that there is no argument for the Globalist theory is clear.

Overall, the facts adduced by Mester that would support the predictions of the globalist theory are at best isolated and sporadic. The clear predictions of the theory, i.e., those that would support the Globalist view, and show that the Localist view is problematic, are not found.

6.4 Paradigm (Non-)Uniformity: Outwards-Sensitivity Redux

It was noted above that the absence of ALLOMORPHIC VACILLATION is something that Globalist theories have no trouble in modelling. Thus, the argument is not that Globalist theories are incapable of accounting for the attested facts. Rather, the point is that the strongest predictions of such theories do not appear to be borne out; along with this, the additional point is that the attested patterns of allomorphy are accounted for in a Localist theory like that of Part I.

One way of sharpening the line of argument from the last section is by considering what kind of factors could rule out ALLOMORPHIC VACILLATION in a Globalist framework. The most obvious way of doing this would be in terms of PARADIGM UNIFORMITY: a constraint (or set of constraints) that ensures that a Root shows consistent allomorphy throughout its set of surface forms. It could be argued, for example, that the reason that *-s*-allomorph-taking *augēre* does not switch from *-s* to *-u* in the 1pl is because the constraints enforcing uniform realization of Asp[perf] outrank the constraints responsible for driving allomorph-selection prosodically. Assuming that something like this could be done, there are two points to be made.

The first point was stressed above: it might be possible for a Globalist theory to appeal to PARADIGM UNIFORMITY, but what the paradigmatic constraints do, in effect, is rule out the cases in which the strongest predictions of a Globalist system can be seen. Thus, while the resulting theory might make Globalist assumptions, it is certainly not an argument for those assumptions. In the absence of any other arguments for global interaction, there is no reason to have a theory that is global, but restrained by PARADIGM UNIFORMITY in the first place. However, if paradigms always are uniform, then the arguments of the last section about ALLOMORPHIC VACILLATION might lose some of their force. If this type of vacillation were universally ruled out, then the absence of vacillation cannot argue against Globalism.

These considerations lead up to the second point, which connects the predictions of the \mathbb{C}_1 -LIN theory with this discussion. The idea sketched above, appealing to PARADIGM UNIFORMITY, can be taken to the limit: if the uniformity constraints always dominate the constraints that would force a change of allomorphs for phonological reasons, there should never be “outwards looking” paradigmatic vacillation. At this point, it is important to recall that there *is* outwards-sensitive allomorphy. This was seen in Chapter 2 in cases like the Hungarian plural/possessive interaction repeated in (46), and in Chapter 3 with the suppletive Latin verb *esse* ‘be’, repeated in a condensed form in (47):

(46) Hungarian Plural/Possessive (Carstairs 1987:165)

Singular	Singular-1s Poss.	Plural	Plural-1s Poss.	Gloss
ruha	ruhá-m	ruhá-k	ruha-ái-m	‘dress’
kalap	kalap-om	kalap-ok	kalap-jai-m	‘hat’
ház	ház-am	ház-ak	ház-ai-m	‘house’

(47) Allomorphy of Latin *esse* ‘be’

	Pres.	Imperfect	Perfect
1s	su-m	er-a-m	fu-ī
2s	es	er-ā-s	fu-istī
3s	es-t	er-a-t	fu-i-t
1p	su-mus	er-ā-mus	fu-i-mus
2p	es-tis	er-ā-tis	fu-istis
3p	su-nt	er-a-nt	fu-ērunt

The Hungarian plural morpheme and the Latin v_{be} head that is ‘be’ each show outwards-sensitive contextual allomorphy, and thus “non-uniform” paradigms. As discussed in Chapters 2 and 3, these effects are conditioned by adjacent nodes; not phonological properties of entire words.

The fact that non-uniform paradigms are found, but in a way that shows sensitivity to local factors, is important. Many well-known cases of suppletion have the same general properties seen with Latin *esse*. If all cases of suppletion (and outwards sensitive allomorphy in general) are conditioned locally, as seems to be the case, then PARADIGM UNIFORMITY cannot be invoked to rescue the Globalist theory.

There is at least one case in the literature in which it has been claimed that “outer” or surface phonology conditions stem suppletion. The example is the verb *go* in Italian. Carstairs (1988) and others have followed traditional discussions of Italian by describing the alternation between *and-* and *va(d)-* in phonological terms. The pattern is that the stem is *va(d)-* when under stress, and *and-* otherwise:²⁴

(48) Forms of *andare*

P/N	Pr. Indicative	Pr. Subjunctive
1s	vádo	váda
2s	vái	váda
3s	vá	váda
1p	andiámo	andiámo
2p	andáte	andiáte
3p	vánno	vádano

For e.g. Burzio (1998), the correlation between stress and suppletion in (48) implies causation in the synchronic grammar: he argues that these facts support a Globalist view, with surface phonological properties determining the choice between *va(d)-* and *and-*. While the description in terms of stress is correct, on the face of it, this cannot play a role in the analysis in the theory presented in Part I, since the output phonology cannot determine earlier VI.

Since the suppletion can also be characterized in morphosyntactic terms— the default *and-* appears in 1pl and 2pl present indicative, subjunctive, and imperatives instead of *va(d)-*, an analysis in which ϕ -features trigger suppletion can be given. As a result, the basic distributional pattern seen in (48) can be stated in either type of theory.²⁵ An important point is that there appears to be no way to look at predictions of the stress-based account beyond the facts in (48): in Standard Italian, there is no way to shift the stress in these forms to create forms in which ALLOMORPHIC VACILLATION is predicted to occur.²⁶ As a result, there is no possibility of really testing the hypothesis that the surface position of stress drives stem choice; any claim to the effect that surface stress must be referred to in deriving the allomorphic pattern can be based only on conceptual arguments. Thus, this case is clearly analyzable with Globalist assumptions, but it provides no arguments for a framework of that type.²⁷

The conclusions to be drawn from this review of outwards sensitivity and non-uniform paradigms are significant. There are cases in which constraints like PARADIGMATIC UNIFORMITY does not apply; i.e., changing allomorphs is not ruled out across the board. In cases where allomorphs do change, the strong predictions of Globalist theories, with non-local factors determining allomorphic selection, should therefore be seen. Critically, though, the attested cases of outwards-sensitive allomorphy show sensitivity to local nodes, in the way predicted by the \mathbb{C}_1 -LIN theory. When there is allomorphic vacillation, the vacillation is not triggered by global phonological context. The strong predictions of Global-MP are not found; appealing to PARADIGM UNIFORMITY does not help.

Overall, then, the point is not that outwards-sensitive allomorphy does not occur; it does. However, the conditions under which it happens are not those that are predicted by a Globalist theory. Another way of putting this is that there is no general prohibition against changing allomorphs based on outer material: PARADIGMATIC VACILLATION does exist. However, it operates in ways that reflect the cyclic and linear restrictions of the theory of Part I: it is driven by local morphemes, not by the phonology of outer morphemes, nor by the phonology of the whole (output) word.

6.5 Summary

The formal predictions of Globalist theories are straightforward. If such theories are correct, there should be cases in which allomorph selection is determined by global phonological properties, in a way that cannot be stated in an Localist theory.

As a general point, theories with even limited amounts of Global interaction between morphology and phonology predict over- and under-application in allomorphy. In empirical test-cases like the Latin perfect and *-io*-verbs, the theory that surface phonology drives allomorphy predicts ALLOMORPHIC VACILLATION with certain “outer” morphemes. This is not found. One possible response to this would be to attribute the non-vacillation to Paradigm Uniformity effects. However, in cases in which there is stem-suppletion or outwards-sensitive allomorphy, (i) paradigm uniformity does not hold, but (ii) there is still no evidence for the predictions of Globalism over Localism.

The conclusion that must be drawn from these arguments is that there is no evidence for the strong predictions of the Globalist framework. In the cases that have been studied in the literature, the patterns that are found are those that are expected from a Localist, cyclic point of view. It is significant to note that these cases are not arguments for “hybrid” theories like Cyclic or Stratal OT; rather, the latter type of theory makes the prediction that global interaction should occur within a given stratum, and there is no evidence that this is correct.

The \mathbb{C}_1 -LIN theory developed in Part I of the book is a Localist theory that makes a number of explicit predictions about how (morpho)syntax and (morpho)phonology interact; these are developed with reference to the phenomenon of contextual allomorphy, which constitutes the central empirical focus of the book. This choice of topics is motivated by the fact that this area provides significant insight into the relationship between syntax, morphology, and phonology, and by the further observation that allomorphic interactions in language are highly restricted. The core proposal of the \mathbb{C}_1 -LIN theory is that possible patterns of allomorphy in language are constrained by interacting cyclic and linear notions of locality. The predictions of this theory are defined and elaborated in a number of examples that are analyzed in Chapters 2 and 3.

The predictions of the \mathbb{C}_1 -LIN theory (and of Localist theories in general) contrast sharply with those made by theories with even a limited amount of global interaction between morphology and phonology. Allomorphy- and phonologically conditioned allomorphy in particular- provides an important test case for comparing opposing Localist and Globalist grammatical architectures, because it is exactly with this phenomenon that it can be determined if global properties of the phonology determine morphology.

The argument of Part II of the book identifies a number of phenomena that could in principle constitute evidence for Globalism and against Localism, and shows that there is no evidence for the strong predictions of Globalist theories. The argument has two components. First, as detailed in Chapter 5, there appears to be little motivation for Phonological Selection- the idea that output phonology is crucial for allomorph selection- when systems of allomorphy are analyzed in detail. This point emerges from a number of case studies, including the detailed analyses of case affixes in Djabugay and Yidij. The second line of argument, which is the most important, is advanced in Chapter 6. It is shown there that Globalist theories predict interactions of a type that cannot be formulated in a Localist theory: NL-APPLICATION, where the factors determining allomorph choice are not local to the node undergoing insertion, and ALLOMORPHIC VACILLATION, where allomorphs chosen for a particular Root change depending on the shape of outer, non-local morphemes. In case studies where these predictions could be manifested, such as in different types of Latin verbal morphology, these effects are not found. Instead, the key cases show patterns that are expected on the more restrictive Localist view.

The attested effects could, of course, be modelled in a Globalist theory; but since there are no cases in which the strong predictions of Globalism are found, restraining such theories by imposing additional constraints to produce the correct results is missing the point. The fact that allomorphic interactions do not show Global interaction between morphology and phonology, and behave as predicted by the Localist theory, argues that the Localist view of the grammar is correct.

These results clearly have implications for how morphology and phonology interact. Although the point is less direct, there are also implications for phonology proper. Globalist theories of phono-

logical interactions are competition-based; crucially, they involve competitions among complex objects, something that is ruled out in the Localist theory of morphology and syntax developed in Part I. Interface areas like allomorphy, where the relationship between morphology and phonology can be examined in detail, show the behavior predicted by Localist theories. The question that must then be asked is what this means for approaches to phonology that employ Globalist assumptions in order to implement competition. It is possible to consider different kinds of hybrid theories as a response to the results presented in this book. However, the type of phonological theory that fits most naturally with the no-competition theory of morphosyntax is a phonological theory with no competition among complex objects; i.e., one in which the sound forms of complex expressions should be inextricably related to the generative procedure(s) responsible for constructing them in a Localist and Serialist fashion.

The following sections outline some further implications of the arguments presented in this book, concentrating first on programmatic implications of the two main parts of the book in 7.1 and 7.2. In 7.3 I return to the theme broached immediately above: the question of what it might mean to have a morphosyntax and a morphophonology that differ fundamentally in their organization.

7.1 The Program I: Competition, Localism, Cyclicity

As stressed at several points in the preceding chapters, a main point of tension between Localist and Globalist architectures is their stance on competition. A grammar that generates multiple potential competitors to express a given meaning is required in order for forms to be compared in terms of optimization of phonological or other properties. Competition among complex expressions is thus a fundamental component of how Optimality Theory implements Globalism. The theory advanced in Embick and Marantz 2008, which looks primarily at morphosyntactic phenomena, holds that there is no competition among complex expressions. All other things being equal, the conclusions of this theory should extend to morphophonology as well. The facts revealed and analyzed in the study of allomorphy in Parts I and II of this book, strengthen the conclusions of the no-competition theory further.

The specific no-competition theory that is advanced in Part I, the \mathbb{C}_1 -LIN theory, holds that cyclic derivation determines when nodes are potentially capable of influencing the form of other nodes, and that linear adjacency is also required for nodes to interact with each other. These proposals must serve as the foundation for additional cross-linguistic work, so that the overall picture of possible allomorphic patterns can be elaborated further.

As a topic for further research, the overall picture of what it means for syntactic structure to be spelled out cyclically for both the sound (PF) and meaning (LF) interfaces has not yet been worked out in detail. While the theory of Part I makes explicit claims about aspects of cyclic derivation at PF, an important topic that remains to be worked out is whether the cyclic domains that are required for syntax, semantics, and phonology are the same. This would certainly be the best result for a cyclic theory. The study of allomorphic interactions provides one window on this larger set of questions, where the \mathbb{C}_1 theory of cyclicity makes one set of assumptions about cyclic domains, and one clear question for further study is how \mathbb{C}_1 cyclicity lines up with the cyclic domains that are motivated on syntactic or semantic grounds.

The results of this book also provide a foundation for a number of further questions that can be asked about the PF computation. First, it remains to be seen exactly how cyclic derivation plays a role in other aspects of PF, and in phonology more generally. Second, for any of these further

domains in PF, there is the question of whether or not there is something like the linear condition seen in allomorphic locality. A related question concerns the “hybrid” nature of the C_1 -LIN theory. The linear component of the theory interacts with the cyclic component so as to restrain possible allomorphic interactions within a cyclic domain to nodes that are adjacent. In a sense, the linear condition “overrides” the cyclic considerations in a limited way, to restrict possible interactions within a given cyclic domain. Whether there is linear override in other aspects of PF computation, and whether there are analogues to the linear effect in other domains outside of PF, are questions of great interest for cyclic theories.

I take questions of the type just outlined to constitute natural extensions of the research program presented in Part I of this book.

7.2 The Program II: Patterns in the Data

Localist theories like the one presented in Part I and Globalist theories of the type considered in Part II differ in terms of what they try to explain in the grammar. The former type of theory provides a theory of formal interactions in terms of the mechanics and architecture of derivations. It does not make reference to the ultimate outputs of any of these computations. Most if not all Globalist studies of morphophonology begin with the claim that the explanatory dimension of grammatical theory must be expanded to include a theory of the properties of outputs; this desideratum is then implemented in a way that requires competition among complex objects, and a Globalist architecture.

The difference in explanatory orientation manifested in these opposing approaches is significant. The Localist theory presented here stands or falls on its empirical predictions, which derive from its formal properties, and from their emphasis on locality and ordering. This type of theory does not make any profound claims about the surface properties of the various phenomena that happen to exist in the languages that happen to exist. Put slightly differently, it provides a mechanical account of a system that generates sound/meaning connections; beyond placing formal conditions on what languages *could* exist in this way, it does not specify a theory of the outputs that it derives.

The arguments of Part II of this book have direct implications for the view that the grammar must make reference to properties of surface forms. A theory with the capacity to say that surface well-formedness in the phonology drives morphology makes the predictions about Global interaction that are at the center of Part II of this book. The argument of Chapter 6 in particular is that the strong predictions made by Globalism architectures— NON-LOCAL APPLICATION, and ALLOMORPHIC VACILLATION in particular— are not found. This is an argument against placing the explanation of surface patterns in the grammar. That is: a theory that is capable of satisfying Putative Loss of Generalization makes strong empirical predictions about Global interactions in grammar, yet these predictions are not supported by the data. It should be concluded from this that trying to account for surface generalizations in the grammar in the first place is the wrong idea. To the extent that there are things to say about surface patterns, these generalizations must be accounted for by other parts of the theory of language.

Situating the explanation of surface patterns outside of the grammar is a strong conclusion: it amounts to the claim that grammatical theories that make reference to output forms in the grammar are misguided. The conclusions in this work must, of course, be limited to morphology/phonology interactions, and patterns of allomorphy in particular. This specific case is clearly part of a larger set of questions about where, in the theory of language broadly construed, different types of generalizations should be accounted for. It can be concluded from the work presented here first, that

questions of this type must be addressed empirically, and not at the level of conceptual arguments; and, second, that in one key domain, the surface-based view is incorrect. At the very least, these results call for a careful examination of other areas in which it is claimed that the grammar itself must account for generalizations about the properties of surface forms.

Regarding such (putative) generalizations, it is important to stress that none of the arguments in this monograph are directed against the idea that there are patterns in the distribution of allomorphs in the first place. In many of the examples studied in this book, it is clear that the attested distributions could be seen as systematic in some sense, and that the surface patterns could be understood in terms of phonological properties. According to the view I have argued for above, if there are important generalizations about why certain patterns of (phonologically conditioned) allomorphy exist that are seen in surface forms, these generalizations must be accounted for in terms of the theory of diachrony, acquisition, phonetics, etc. The programmatic conclusion is that careful study of the dynamics of language must be undertaken to see to what extent Global concerns actually play a role in the historical developments that shape languages. This is an empirical question, and it could be answered in either direction. It could turn out to be the case that cases of putative Global interaction in diachrony turn out to be epiphenomenal, or it could be that such interactions are crucial to explaining how languages develop. Either one of these claims is worth pursuing in its own right, as long as it is recognized that considering a (limited) role for global interactions in diachrony falls far short of positing a Globalist architecture for the synchronic grammar.

7.3 Epilogue: Phonology without Morphology/Syntax?

This monograph makes arguments that are based on the behavior of allomorphic interactions. It does not examine all predictions of Globalist theories of phonology, only those related to the specific question of how morphosyntax and morphophonology interact in one crucial case study.

One conceivable response to these arguments is that Globalist-oriented research in phonology is not affected by arguments that bear on morphology, or morphology/phonology interactions. In my view, this kind of response would be a grave error; it represents a failure to understand the depth of what is at issue. Globalist theories of phonology cannot really abandon morphology. This follows from the fact that the inputs to any non-trivial competition are complex objects; i.e., they consist of more than one piece. To the extent that syntactic theories of morphology like the one advanced in Part I are correct, the complex objects that are the input to phonology are constructed in the syntax. In a Globalist framework, this expands the set of predictions concerning global interactions, since the phonological constraints are predicted to interact with the syntax in the same way that they are predicted to interact with morphology. There is no way to avoid the conclusion that a theory of phonology must account for how sound forms relate to the system responsible for creating complex objects.

Globalist theories predict that the constraints regulating the position, combination, and allomorphy of complex expressions should interact with constraints determining its surface phonological form. If, as argued here, these interactions are not found, then it must be asked why not; i.e., at a minimum, it must be asked if (some part of) phonology operates differently from syntax. Any other move, such as hypothesizing morphological constraints invariably outrank phonological constraints, constitutes a tacit admission that the Globalist architecture does not make the correct predictions as it stands. The same conclusion extends to Cyclic or Stratal versions of Optimality Theory, in which Globalism is restrained, since there is no evidence for global interaction even within a restricted

computational domain (i.e. one stratum).

In short, it appears that even a limited amount of global interaction between morphology and phonology leads to incorrect predictions about allomorphy, and that developing Localist theories must be at the center of current research. My hope is that the theory presented in Part I of this book provides a foundation for future research along these lines.

Notes

Notes to Chapter 1

1. In the broader background it is worth noting that this sort of tension has been discussed from the reverse perspective; see Bromberger and Halle (1989).
2. As discussed in Chapter 3, these allomorphs are better treated as *-ui* and *-si*. While this point plays a role in the discussion of that chapter, it has no bearing on the main point in the text.

Notes to Chapter 2

1. It is assumed here that Roots possess a phonological underlying form, and that they are not subject to Vocabulary Insertion in the way that functional morphemes are. There are reasons to think that phonological properties alone do not suffice to uniquely identify a Root in all cases. For example, the existence of homophonous Roots (e.g. *bank* ‘financial institution’ and *bank* ‘side of a river’). Examples of this type indicate that Roots must be distinguished from each other by something other than phonology, such as abstract indices.
2. In the approach of Halle 1990, function nodes contain a dummy phonological matrix Q , which is replaced by the phonological exponent of the VI. Other formalizations of this process are conceivable.

Beyond the addition of an exponent to a node, other possible effects of VI would be, for example, the deletion of the features that condition insertion, although this is contentious (some comments on this point appear in the case study from Latin perfect agreement endings in Chapter 3).

3. See Kroch 1994 for some pertinent observations about putative cases of “vocabulary specific” linearization.
4. For present purposes it does not matter whether the DP’s PF properties are computed in a separate cycle, as might be the case in a theory with cyclic spell-out.
5. For example, it might not be necessary to have distinct $*$ and \frown operators in linearization statements; this depends on whether these operators are *typed*. See Embick 2007b for some discussion.
6. This of course does not imply that there is only one type of phonological interaction in such objects.
7. Some intermediate copies of moved elements have been removed for simplicity.
8. Of course, this does not mean that M-Words and Subwords are linearized in the same direction with respect to one another. As is well-known, heads may differ in their position in complex heads versus phrases. In the view advanced here, these differences are reducible to the structural difference between M-Words and Subwords.
9. This does not, of course, mean that the notion of “paradigm” has no utility elsewhere in the study of language; for example, in the study of diachronic patterns, or of acquisition, or even in processing. The point is that the system responsible for the generation of grammatical forms makes no use of

paradigmatic information.

10. These are not necessarily the only phases in the theory; phases implicated in the work of Chomsky (2000,2001) and others– e.g. C and D– could be part of this type of theory as well. There is a question as to whether category-defining heads and C, D, etc. have the same status, however. Some points along these lines are advanced in Chapter 3, in a discussion of French prepositions and determiners.
11. Thus, for instance, in a structure like $[x [Z \sqrt{\text{ROOT}}]]$, where x is category-defining and Z is not, x counts as Root-attached.
12. There are some additional cases like *color-iz-ation* where an exponent other than *-ing* appears in an Outer domain as well. See Chapter 3 for discussion.
13. See Embick 1996 for an early formulation of such a theory.

Beyond the “typical case” of Root-attached category-defining heads x , the \mathbb{C}_0 allows non-cyclic heads in the Inner domain to show Root-determined allomorphy.

14. At least, this interaction is ruled out if Readjustment Rules are subject to the same cyclic locality conditions as instances of contextual allomorphy; see Chapter 3 for discussion.
15. Questions of this type are also touched on in Aronoff 1976, in a way that influenced other early work on cyclic interaction, such as the *Adjacency Condition* of Allen (1979) and Siegel (1978), and works like Williams 1981 and Scalise 1984.
16. It is possible that this potentiation is restricted to the “potential” adjective head that is realized as a .
17. With the Root $\sqrt{\text{ATROC}}$, the n affix that is pronounced *-ity* yields the noun *atrocitiy*. When this Root is merged with a , the a head is pronounced *-ous*, to yield *atrocious*. With *curiosity*, the Root is $\sqrt{\text{CURIOUS}}$. This accounts for the lack of “truncation” in the latter case. See Embick and Marantz (2008) for discussion.
18. This definition connects with definitions of *Phase Impenetrability*, as explored in Chomsky (2000,2001) and related work.

Note that while elements become inactive in the sense defined in the text, the phonological matrix associated with such elements still might interact with later stages of the derivation; see 3.4.2.

19. The idea expressed here appears in earlier theories as well; see e.g. the discussion of Carstairs-McCarthy 1992:67 with reference to the “Adjacency Condition” of Allen 1979 and Siegel 1978.

Lieber (1992) discusses a set of constraints on the percolation of features that restricts how much information is available to outer nodes in a way that is similar in some cases to what is proposed here: the visibility of features at “outer” morphemes is regulated by principles of percolation that stop features from moving up beyond category boundaries. The difference between cyclic and non-cyclic nodes posited in this work builds on this important insights behind this aspect of Lieber’s theory. At the same time, a detailed comparison of percolation versus cyclicity plus adjacency is beyond the scope of the present discussion.

20. As noted earlier in the text, there is perhaps non-cyclic functional structure between *v* and Outer *n*. This does not bear on the immediate discussion but is relevant when some additional cases are taken to account. These points are discussed in Chapter 3.
21. For example, the “special” agreement endings in the Latin perfect tense discussed in Chapter 3 appear to make reference to an adjacent Aspect node that has a $-\emptyset$ exponent with some verbs. If this particular Aspect node were pruned, the overall statement of the agreement allomorphy would be complicated.
22. The importance of looking at both inwards- and outwards-looking allomorphy is stressed in Carstairs 1987.
23. Carstairs (1987) concentrates on an additional point– the idea that the externally-sensitive form does not vary by the specific features of outer morphemes, but is consistent across different person/number combinations (also Carstairs-McCarthy 2001,2003). Carstairs-McCarthy proposes that sensitivity to node type (and not the feature content of a node) is a general property of outwards but not inwards sensitive allomorphy. This asymmetry is not predicted by the account that I have presented above. However, there are some instances of person/number driven suppletion in verbs that might show the “node type but not content” generalization; these are discussed in 3.2.2
24. There are other types of cases that are not necessarily covered by the two categories outlined in 2.5.1 and 2.5.2. For example, Jonathan Bobaljik (personal communication) notes that Chung (2007) discusses what looks like stem suppletion conditioned by honorification in Korean, operating in a way that is non-local from the perspective of the theory advanced above. One question to ask is whether the honorific examples involve actual suppletion (i.e., contextual allomorphy), or are instead instances of different Roots.

Notes to Chapter 3

1. The pluperfect subjunctive contains two such pieces, *-s* and *-sē*.
2. This rule might have to be restricted so that it applies in derived environments; it appears to apply only before /r/'s that are the result of the *Rhotacism* rule discussed later in the text.
3. Invisibility might be a more general property of T[*pres*] in Latin, which does not appear in the non-perfect system either (see Embick and Halle (forthcoming)) for discussion.
4. Some additional complications– e.g., the fact that the 1s AGR also has an *-m* allomorph in addition to *-ō*, are ignored in (10).
5. Note further that the contextual effect of Asp[*perf*] requires reference to the “abstract” form of this morpheme. As noted in the text, this head has three allomorphs, *-v-*, *-s-*, and $-\emptyset$. The same special forms of AGR are selected with all of these allomorphs:
 - (i) a. *amā-v-ī* ‘love’
 - b. *scrip-s-ī* ‘write’
 - c. *ven-∅-ī* ‘come’

The sensitivity to the features of Asp[perf] and not to the exponents that are inserted into that node follows directly if there is no ‘discharge’ or ‘erasure’ of features that are already spelled out by earlier applications of Vocabulary Insertion. The discharge of features with insertion may be required under other circumstances, as discussed in Noyer 1997; see also Bobaljik 2000.

A further point is that in order for the AGR allomorphs to see Asp[perf] in the way described in the text, it must be the case that Asp[perf] with the $-\emptyset$ allomorph like (i.c) is not Pruned. As noted in Chapter 2, Pruning does not affect all morphemes with null realization.

6. Oltra-Massuet generalizes this claim to other functional heads such as T in her analysis of Catalan, a move that might be motivated for Latin as well (cf. Buck 1933, Williams 1981, and Aronoff 1994 for similar suggestions). Whether or not this extension is compatible with the linear theory of allomorphy is not clear. See Embick and Halle in prep. for some discussion.
7. An alternative would be to copy the features of the Root onto the v , via a sort of “concord” operation; or, it would be possible to simply have the v or the theme node acquire features like e.g. [IV] in the context of certain Roots.
8. Descriptively, *fused* affixes express two different types of features. I reserve capitalized *Fusion* for a structural operation that combines the contexts of two nodes; see below.
9. The theory does not, however, prevent cyclic heads from ever being involved in fusion. In principle, it is possible for a cyclic head to Fuse with e.g. its non-cyclic edge+ heads.
10. The class with $-\emptyset$ in the transitive show some differences in the stem phonology in the intransitive form. The *-aa* affixed transitives also show a kind of vowel reduction process on the stem.
11. A small class of verbs that apparently have nothing in common show variation in the indirect causative, with *-aa* being possible along with *-v-aa*. Evidently, the two forms are identical in meaning. All of these are verbs that take the $-\emptyset$ allomorph in the transitive form.
12. It is assumed that Roots are visible for insertion at the Inner Voice[AG] head because the v head in this configuration is Pruned.
13. The head that appears in indirect causatives is a different type of passive head from the head found in passives that are not embedded in causative structures. Hindi passives are formed analytically, with the verb ‘go’ functioning as an auxiliary. The main verb is in a participial form, with an Aspectual head that has the exponent *-aa*. The verbs that show *-aa* and $-\emptyset$ for Voice[AG] in transitives show the same exponents in passives, followed in each case by an additional *-aa* morpheme for the Asp head mentioned just above (the sequence /aa-aa/ is pronounced with an epenthetic glide):

(i) Passive forms

Intransitive	Transitive	Passive
$\sqrt{\text{ROOT-}v}$	$\sqrt{\text{ROOT-}v}$	$\sqrt{\text{ROOT-}v^\dagger\text{-Asp}}$
bãṭ- \emptyset	bããṭ- \emptyset	bããṭ- \emptyset -aa
bach- \emptyset	bach-aa	bach-aa-aa

In other words, there is in these cases no difference between the Voice exponent in the active and the passive. See Bhatt and Embick 2003 for additional discussion.

14. The most salient is the fact that not all cases that are called *suppletive* in traditional descriptions are necessarily cases of contextual allomorphy. Some of these might actually involve *defective* patterns of Root distribution.
15. Whether this works empirically for all cases classified as suppletion is another question; see e.g. Corbett 2007 for a survey of the phenomenon. See, however, the qualification about what might count as suppletion in Fn. 14.
16. A further question is whether this type of analysis extends to the present subjunctive, where v_{be} shows an s- stem as well.

Beyond this particular example, there are serious questions about the factors that constrain suppletion triggered by valued ϕ -features. In a worked out theory of suppletion triggered by features from AGREE, the visibility of features on T to v must be restricted to occur only with particular types of light verbs. In particular, it appears that only intransitive light-verbs show suppletion based on the person and number of the subject. In familiar patterns of suppletion in transitives, it is features of the object that trigger the different alternants (see e.g. Hale et al. (1990)).

17. Although larger objects like CP are not addressed here, there is evidence from phrasal phonological interactions for cyclic spell out in this domain. See the discussion in Pak 2008.
18. Certain aspects of (35a) are simplified for expository convenience. For instance, the formulation of (35a) does not take into account similar cases (such as with prepositions, e.g. *d'argent*). For some further points about (35b), see Embick 2007b.
19. The way that this analysis works, the n heads are the same, and what distinguishes them allomorphically is the type of structure that they attach to. Another possibility is, of course, that there are different types of n involved, so that, for instance, the n realized as *-ness* would be featurally distinct from the n realized as *-ing*. I have not pursued this type of treatment above, since the most parsimonious treatment is one that keeps the number of primitives to a minimum. Whether there is evidence in favor of a “different n ” treatment in this case is not clear at this point.
20. For a discussion of the first of these points see Embick and Halle (2005), where comparisons are made with theories that allow the storage and selection of “stems”.
21. Thanks to Don Ringe for bringing this example to my attention.
22. The point about foot boundaries leads to a particularly strong set of predictions in metrical theories with single brackets, such as Idsardi 1992 and subsequent work: phonologically conditioned allomorphy associated with footing should only be possible at the particular points in the representation where a foot boundary appears.
23. Pak (2008) presents evidence suggesting that the linearization procedure that is responsible for dealing with such structural configurations has some special properties, and that these can be detected in patterns of (phrasal) phonological interaction.

24. In reality, the sequence /o-i/ compresses to /u/, which is what appears in the orthography (*ulbaləʔ*, *ulbasəʔ*, etc.).
25. One implication of this analysis is that there is more than one sense of “infixation”. When the units involved are syntactic— Subwords and M-Words— operations like Local Dislocation may infix a morpheme by interpolating it. On the other hand, there are operations in the phonology that do something that is similar in the abstract, but which function in terms of a different set of primitives (i.e. syllabic or metrical units, not Subwords and M-Words).

On this general theme, Blevins (1999) and Yu (2004) discuss cases of “phonological” infixation where the predictions of certain Globalist models of morphology and phonology are not borne out. As with the case of other work in this area, however, these works do not go far enough in terms of asking whether there is evidence for any aspect of the Globalist architecture; see Part II for discussion.

Notes to Chapter 4

1. As noted in the last chapter, arguments centered on the predictions of $P \gg M$ for infixation see Blevins 2004 and Yu 2007.
2. The possibility exists that patterns of irregular allomorphy, while not determined phonologically, are associated with particular phonological neighborhoods, as has been studied extensively in the context of the English past tense. At the same time, there is no reason to think that such calculations play a role in the synchronic grammar of the language, whatever role they might play in the acquisition of lists.
3. A further point is that in order for the syllable structure constraints to play the dominant role here, it must be assumed that DEP/MAX are ranked higher than ONSET/NOCODA; otherwise, various “fixes” with deletion or epenthesis could win. This point is important in some of the case studies below in Chapter 5.
4. Of course, in this type of case an analysis with competing allomorphs might not be warranted. It would be possible to posit one (e.g. *-nun*) allomorph, along with a morphophonological rule that deletes the initial /n/ with C-final stems. Since these concerns are irrelevant to the overall point, I put them to the side here.

Notes to Chapter 5

1. This morpheme also appears in contexts that are not typically associated with determiners. However, these syntactic complications do not affect the general set of points about allomorphy that are considered in the text.
2. Moreover, there are no general reasons for positing rules/constraints that delete intervocalic /l/; see Klein 2003 for discussion.
3. Another point noted in the works above is that the distribution of allomorphs is rendered *opaque* by glide insertion, since underlyingly glide-final nouns take the *-la* allomorph, not the *-a* allomorph. The important questions raised by opacity are taken up in Chapter 6.

4. McCarthy (2002:154) considers something similar to this, noting that “...the constraints responsible for allomorph selection may be only emergent and not otherwise active in the language under study.” Again, it is hard to see how cases of this type could provide evidence for Phonological Selection. If the phonological analysis does not extend beyond a single case of allomorph selection, then the only argument in favor of such a treatment over one with ordered VIs would be conceptual, i.e., based on Putative Loss of Generalization.
5. There are some discrepancies between the descriptions in Patz and Hale concerning the form of the genitive morpheme. Hale (1976:239) gives the “short” genitive allomorph as *-n*, i.e., with lengthening of the preceding vowel: *bama* ‘man, Aborigine’ is given with genitive *bama-:n*. Patz 1991 and others who use this source do not indicate this length. Dixon (1977:136) cites the morpheme as *-:n* like Hale, and this is assumed to be correct here.
6. Regarding the status of this constraint, affixation can produce what look like complex codas word-internally in the language (e.g. *baɖigal* ‘turtle’, ergative *baɖigal-ndu*). If, however, Djabugay treats homorganic nasal-stop sequences as prenasalized stops, the codas are not actually complex. Nash (1979) proposes this for Yidiɲ (see below for some discussion).
7. One could ask whether, given this formulation, \emptyset allomorphs should always win when they are available, given that they are (i) minimal, and (ii) unlikely to create phonological problems. Kager does not consider this possibility. Similarly, one could ask about cases in which the competing allomorphs are of the same size, as far as segment counting goes. There seems to be little reason to dwell on these details, however.
8. Here and below, I employ *-ɖ-* for Patz’s *-dj-* and Hale’s *-tʲ-*. The digraph *-rr-* is used for a trill.
9. The noun *bama* ‘(aboriginal) man’ takes the ergative affix *-lu*. This exponent is not found elsewhere in the language, although there are instrumental/locative forms with *-la* that are related to it.
10. An alternative would be to posit a *-da* allomorph in (f), so that it is the stem-final /n/ that surfaces in the inflected form. While this removes this particular case of opacity, there seems to be little to be gained by this move.
11. Dixon (1976) describes the basic historical pattern for ergative as typically assimilating *-du* with C-final hosts, and *-lu* or *-ɲgu* with V-final hosts; the same in locatives but with *-a* instead of *-u*. In Djabugay, there is no *-ɲga* locative. The overall picture concerning the history of the cases has been refined in various ways since the time of these early proposals (see Dixon 2002 for summary), but the basic connection between ergative and locative cases stands.
12. Other cases exist as well, but these do not add much to the discussion beyond what can be learned from (14), so I will concentrate on ergative, inst/loc, genitive, and dative below.
13. The patterns in (21d) show some variation, as is the case also with (21e). Deletion of final rhotics is obligatory with even-syllabled stems, and optional for odd-numbered stems (Dixon 1977b:127). The pattern of deletion with /y/-final stems appears to be less systematic.
14. That is, the expected locative+ of *buɽi* is **buɽi:l*. It turns out that there are five disyllabic nouns in which the final /l/ that is expected by the phonology does in fact surface. For example, Dixon

(1977a:50) gives *dugi* ‘tree’, with locative+ *dugi:-l*. The normal case can be treated as involving a rule of /l/-deletion, with the nouns that show final /l/ being an exception to this.

15. Deletion with stem-final rhotics is obligatory with even-syllabled stems, and optional with odd-syllabled stems (Dixon 1977b:129). With /y/-final stems, omission of the final consonant is reported to be variable (recall the ergative).
16. In the COM(itative) case of *mabi*, the surface *mabi:* results from a rule applying to *mabi:-y* to delete the final glide.
17. Long vowels affect stress placement. The interaction of stress with the placement of long vowels in Yidij words is extremely complex, and, to a first approximation, looks “conspiratorial”, in a way that excited Dixon’s description, and some analyses following his overall perspective (e.g. McCarthy 2002 and references cited there). The interaction of length with foot construction and stress assignment presents a number of challenges, as recognized by Halle and Vergnaud (1987). I leave a fleshed out theory of stress in Yidij for later work.
18. For *maḍinda* here the affixed form is called by Dixon a “dative subordinate”; this reduces by *FSD*, unlike the regular dative, which is an exception to this rule.
19. Another possible take on why *-gu* does not delete in *bipḍi:n-gu* could be based on some notion of *contrast* from the base or “unmarked” form *bipḍin*. It could be argued, for instance, that deletion of *-gu* is banned because the resulting form **bipḍi:n* would be “too similar” to the base *bipḍin*. This analysis would fail in e.g. the Comitative case, where, for the stem *mabi* ‘kangaroo sp.’ surfaces as *mabi:*. In the analysis with *PL* and *FSD*, the expected case allomorph *-yi* reduces to /y/ by *FSD*, following lengthening of the /i/ vowel, to yield /mabi:-y/. Then /i:y/ is simplified to /i:/. The surface form differs from the “base” form only in terms of vowel length, exactly as **bipḍi:n*. Thus, unless the approach based on contrast is to be stipulated on a case-by-case basis, it appears to be on the wrong track.
20. This way of formulating the rule requires that in e.g. *-ḡgu*, the *ḡ* component must not be syllabified. Thus if homorganic nasal/stop sequences behave as prenasalized stops (i.e. as a single consonant), as proposed by Nash (1979), this syllabification must take place subsequent to the *FSD* rule.
21. In the final line of *mulariḡgu*, the idea is that the /ḡ/ of the ergative case morpheme is resyllabified as a coda. For a discussion of some cases in which it appears that there are pre-nasalized stops in Yidij, see Nash 1979.
22. The second verb here is derived from *gali* ‘go’ with the comitative affix *-ḡa* and the *-l* conjugation suffix.
23. Some of the details of the VIs could be modified slightly, without changing the overall picture. So, for example, it might be possible to posit an additional ergative morpheme *-Cu*, where the C is a stop that undergoes assimilation in place to left-adjacent consonants. Then *-ḡgu* would be inserted after vowels and the semi-vowel /y/, and *-Cu* otherwise. It is not clear that this modification would add much to the discussion, however.
24. I put to the side constraints that would favor assimilated affixes like *-du* for the ergative over non-

assimilated forms.

25. Moreover, *Penultimate Lengthening* as part of the phonology fares much better in cases in which nouns bear more than one affix. This is seen in the phenomenon of “Suffixaufnahme”, where, in possessive contexts, the case of the head noun appears after a genitive morpheme on non-heads, yielding Noun-GEN-ERG for a possessor in an ergative DP. So, to set the stage for this doubly-affixed form, *guda:ga* ‘dog’ has the genitive *gudaga-ni*. The “morphological” treatment of vowel length would put this noun in the class that shows long vowels only in unaffixed forms. However, when nouns like this are further affixed with ergative “Suffixaufnahme”, long vowels appear where the phonological analysis predicts: in the case at hand, the form is *gudaga-ni:-ŋ*, where the ergative morpheme appears after the genitive morpheme. Once the addition of the ergative morpheme creates the appropriate phonological conditions (an unfooted final syllable), lengthening occurs. A “morphological” account misses this effect. A similar point is made with *bupa:n* ‘woman-GEN’, with *bupa-nu-ŋgu* ‘woman-GEN-ERG’. This stem does not simply show a long stem vowel whenever genitive is present, as the second form shows; it shows a long stem vowel only when the phonological context is appropriate. Treating vowel length as something other than the result of *PL* simply does not work very well.

Notes to Chapter 6

1. It is for this reason that in this and other cases, many analyses in Optimality Theory have moved towards *paradigmatic* resemblance with other morphological forms. That is, if there are no phonological reasons why the form should be as it is, then the reasons must be morphological in nature. As noted in the first chapter, such theories are clearly incompatible with the Localist theory of morphosyntax of Part I. See also Bobaljik (2002,2008).
2. This is one way of putting it; it would be also possible to say that the notion of Local Conditioning Environment is immaterial, or derivative, or epiphenomenal, etc. in such theories.
3. The rule is simplified, in that it actually applies only with certain affixes; see Inkelas and Orgun 1995 for discussion.
4. An alternative is to posit a single VI with the exponent *-sI*, and some additional rules to delete the consonant under specific circumstances; see below.
5. Here and below matters related to the vowel component of *-(s)I* are ignored.
6. In Turkish', the effects of *Velar Deletion* would be seen only with morphemes that have no consonant-initial allomorphs.
7. So if Z were an AGR node, Z1 and Z2 would represent different combinations of person/number features, for example.
8. A similar behavior for certain affixes is reported by Fulmer (1997) for the language Afar.
9. There are some other combinations in which the same type of point could be made. For example, consider an odd-syllabled host that takes both the passive affix and one of the alternating agreement morphemes: Root-PASS-AGR. An even-syllabled output could be derived by inserting the (locally

unconditioned) disyllabic passive affix, then a monosyllabic outer affix. As far as I am aware, this does not occur.

10. I am putting aside Reduplication, along with various stem-changing processes that apply in the perfect. These cases can be treated as cases with the $-\emptyset$ exponent of Asp[perf], in which there is, in addition, action in the form of Readjustment Rules.
11. Mester (1994:47) excludes from consideration verbs that he classifies as “denominal”, which do not take the allomorph expected on prosodic grounds alone. For example, *albēre* ‘be white’ has a heavy stem, but shows the *u*-perfect *alb-u-ī*.
12. I am putting aside initial trapping here— representations in which the initial syllable is unfooted— although see below.
13. Mester also considers “marked” trochees where $\bar{\sigma}\acute{\sigma}$ is footed as $[\bar{\sigma}\acute{\sigma}]$ instead of as $[\bar{\sigma}]\acute{\sigma}$. In the latter type of approach, the trimoraic trochee is what is avoided when possible.
14. The forms in (32) include three distinct entries for 3pl because three different agreement endings— *-ērunt*, *-ēre*, and *-erunt*— were in variation in this context. In principle, something about optimization could be learned from *-erunt*; cp. *monuerunt* $\acute{\sigma}[\acute{\sigma}\acute{\sigma}]\langle\bar{\sigma}\rangle$ with *augserunt* $[\bar{\sigma}]\acute{\sigma}\langle\bar{\sigma}\rangle$. See Sommer 1914: 579 for correlations between perfect allomorph and 3pl agreement endings that might be worth looking into in the context of Latin historical phonology.
15. Mester uses an argument based on putative ALLOMORPHIC VACILLATION in his second case study from Latin *-io*-verbs; see below. The failure of Perfect allomorphs to vacillate is not addressed.
16. In order to work properly in this particular case, the allomorph found in the perfect would have to be preferred to the one favored on metrical ground in the pluperfect, presumably something that could be accomplished in terms of making the former less marked.
17. This analysis draws in part on joint work with Morris Halle, most of which (with the exception of Embick and Halle 2005) has not been published.
18. With the exception of the theme vowel in conjugation III, given here as */-i-/*, this is more or less uncontroversial (recall the comments in Chapter 3). Verbs in this conjugation show an *-i-* theme vowel in certain person/number forms (e.g. *dūc-i-t* ‘he/she leads’), but, unlike the III(i) type verbs, this vowel does not appear in 1s forms *dūc-ō*. There are other options for the vowel here that have been explored in the literature (e.g. Lieber 1980). Since this particular assumption does not play a role in the analysis of the perfect, I will not say anything more about it.
19. For conjugation *iuvō*, *iuvī* ‘help’ looks like a *-i-*perfect. The stem-final */v/* in *iuvāre* makes this case, an apparent instance in which a verb of conjugation I takes a *-i* perfect, questionable at best. Conjugation II has some apparently thematic perfects; e.g. *flēre*, *flēvī* ‘weep’. Aronoff argues (as does Ernout (1952/1989) that these verbs are not actually in conjugation II. Rather, they happen to end in */-ē-/*. The argument is based on the fact that Roots are minimally CV. The suggestion is attractive in that it allows for a cleaner statement of the rules concerning the presence or absence of themes in these verbs in perfect and participial forms, which are then always athematic (though there are some */i/* vowels in participles, e.g. *mon-i-tus* for *monēre*.)

Another pattern I am not taking into account here involves apparent “conjugation change”. For instance, *petō* ‘seek’, with infinitive *pet-e-re*, seems on the basis of these two forms to be conjugation III, like *dūcō*; likewise for conjugation III(i) *cupiō* ‘desire’, with perfect *cup-ī-v-ī*. However, the perfect form is *pet-ī-v-ī*, evidently with the *-ī*-Theme that characterizes conjugation IV verbs like *aud-ī-re*. There are a handful of verbs that behave this way, all showing conjugation III or III(i) behavior in the present system, and the *-ī*- of conjugation IV in the perfect.

Finally, in line with the exclusion of stem-changing processes, I have not included Reduplication as a separate class here, on the assumption that these are a subcase of the Ø-affixed perfects.

20. See Aronoff 1994 for some discussion of the fact that there are in many cases systematic patterns in the perfect, regarding in particular the claims of Lieber 1980 about the irregularity of the system of perfect formation.
21. There are some exceptions to the light stem pattern. Light-stem verbs that end in the liquids are in conjugation IV, not III(i).
22. Another prediction is that verbs like *venīre* that have a long theme in spite of having a light root syllable should show a short theme when these verbs have a heavy prefix. There are two problems here. The first is that Mester offers no explanation as to why these verbs should ever surface with *-ī*- instead of *-i-* in the unprefixated forms in the first place. The second is that this additional prediction is not verified.
23. It is true that there are many cases in Latin where theme vowels differ in prefixed and unprefixated verbs: e.g., *pellere, compellāre; spernere, aspernārī; capere, occupāre; specere, suspicārī* (Sommer 507ff.). These differ in themes and deponency, and raise questions about when two forms may be said to contain the same Root, as well as other questions about morphophonology. But whatever there is to say about such cases, they offer no support for a Globalist theory of morphology and phonology.
24. Carstairs (1987:179ff.) looks at some additional cases of allomorphy that are putatively “outwards sensitive” to phonological properties. These cases do not appear to be fully suppletive; that is, it looks like the majority involve morphophonological rules, not competition for insertion, and thus are not directly relevant to the issue at hand.

The central cases (Carstairs 1987:185ff.) come from Fula, and are based on work by Arnott (1970) and McIntosh (1984). One set of examples involve affixes that differ between “short” and “long” forms: anterior *-noo/-no*, relative past passive *-aa/-a*, and relative past middle *-ii/-i*. The factor conditioning the alternation is phonological, and the alternation itself is clearly not suppletive. The other case is found with the “habitual imperative singular” suffix, which is typically *-atay*. In the first person singular, this morpheme surfaces as *-at*. While there are some phonological correlates of this (the 1s affix follows the habitual imperative morpheme, and is the only vowel-initial agreement morpheme), the alternation is not necessarily suppletive, and, moreover, can be stated with reference to the 1s features, so that the phonological effect is incidental.

25. The same pattern of features is required elsewhere in the language’s verbal system. As discussed by Carstairs (1988,1990), the morphosyntactic pattern seen in (48) is seen with other verbs, where it conditions e.g. insertion of the “infix” *-isc*; for example, with the verb ‘finish’, there is 1s *fin-tsc-o*

but 1p *fin-iámo*: on the face of it, *-isc* does not appear with stressed affixes.

Maiden (2004) presents a detailed study of such stem alternations in Romance, concentrating on the question of whether particular patterns of paradigmatic distribution of “stems” calls for a morphological (versus e.g. phonological) treatment. Looking at patterns like that seen in Italian, he presents arguments (2004:159ff.) against the view that surface placement of stress must be referred to in these patterns of stem allomorphy. See also Corbett 2007:22 for related discussion.

26. I thank Andrea Calabrese for discussion of this and related points.
27. The need to look for vacillation in this system is touched on in Kiparsky 1996:25, which cites comments by Dressler in a discussion period (see also Maiden 2004:161). It appears that the word *àndiriviéni* ‘coming and going’, where secondary stress appears on *and-*, does not conform to an analysis in which stress drives allomorphy. However, this form might not be probative, since it is not clear what its synchronic relationship to *va(d)-/and-* is.

In some dialects of Italian, stress shift can be induced by encliticization. As far as I am aware, there is no evidence that stem-suppletion with *go* vacillates in such cases.

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