Isomorphy and Syntax-Prosody Relations in English

by

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A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved April 2019 by the
Graduate Supervisory Committee

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ARIZONA STATE UNIVERSITY

May 2019

ABSTRACT

This dissertation investigates the precise degree to which prosody and syntax are related. One possibility is that the syntax-prosody mapping is one-to-one ("isomorphic") at an underlying level (Chomsky & Halle 1968, Selkirk 1996, 2011, Ito & Mester 2009). This predicts that prosodic units should preferably match up with syntactic units. It is also possible that the mapping between these systems is entirely non-isomorphic, with prosody being influenced by factors from language perception and production (Wheeldon & Lahiri 1997, Lahiri & Plank 2010). In this work, I argue that both perspectives are needed in order to address the full range of phonological phenomena that have been identified in English and related languages, including word-initial lenition/flapping, word-initial segment-deletion, and vowel reduction in function words, as well as patterns of pitch accent assignment, final-pronoun constructions, and the distribution of null complementizer allomorphs. In the process, I develop models for both isomorphic and non-isomorphic phrasing. The former is cast within a Minimalist syntactic framework of Merge/Label and Bare Phrase Structure (Chomsky 2013, 2015), while the latter is characterized by a stress-based algorithm for the formation of phonological domains, following Lahiri & Plank (2010).

DEDICATION

For Squishy.

ACKNOWLEDGMENTS

A section like this is difficult to write because it's never really complete. The more time I spend thinking about it, the more acknowledgments are needed. Even so, I'll try to hit the main points. If I don't mention you specifically, it's because I wrote this at the end, and I was pretty tired at that point, so forgive me.

First and foremost, I must acknowledge my committee members, Elly van Gelderen, Kathryn Pruitt, and Andrew Carnie. Their many comments and critical feedback have kept my weirder ideas in check and forced this work to become better, sometimes in spite of itself. I am grateful to all of you, but I must especially single out Elly, who is known by many for her constant encouragement, breadth of knowledge, and overall thoughtfulness as a scholar and human being. Over the course of my graduate and doctoral studies, I have been the recipient of all of these things, and I would not be the scholar I am today without her support and counsel. Thanks, Elly.

Second, I want to thank the members of the ASU Syntax Reading Group both past and present for listening to some bad drafts of this material. That includes (in no particular order) Robert LaBarge, Sayantan Mukherjee, Sakshi Jain, Annette Hornung, Carrie Gillon, Johanna Wood, Mekhlid Alsaaedi, and many others. You've given me many hours of good discussion over the years, and I hope I've been able to give it back in kind. In addition, a note of thanks to the Linguistics Department at the University of Arizona. Although I am not a member of the department, the faculty and grad-students there have always been welcoming and hospitable to me and other ASU students. Thanks in particular to Massimo Piatelli-Palmarini, Adam Ussishkin, and—of course—Andrew Carnie.

Finally, I also want to acknowledge the friendship of colleagues in my teaching cohort at ASU. That includes Sean Moxley-Kelly, Katherine Morelli, Sarah Jackson, Ian Johnson, and Alice Hayes. A Ph.D. is a hard thing to complete without friends, so you all deserve some credit for this. Sean in particular spent far too much time over the two years DMing for a D&D group that ultimately helped keep me sane in the thick of dissertation-writing. None of you ever saw a word of this dissertation, and you never asked to see one. I am totally, unequivocally, okay with that.

There are so many other people to mention: my family, who have been there for me throughout this whole process, past teachers and collaborators whose time and input were more influential than they knew—the list goes on. I'll attempt to tell them in person, since they might never read this work (who would blame them?), with one exception: I want to single out my wife, Nicole, for special consideration. She married me about halfway through my doctoral studies and has made the journey with me, through thick and thin, through good times and bad times, happy times and sad times. She is my heart. That's as good a note to end (or start) on as any.

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CHAPTER 1

INTRODUCTION

This dissertation investigates the precise relation between the domain of prosody and the domain of syntax. Two differing theoretical perspectives are addressed. The first assumes a direct, or "isomorphic", mapping between syntactic primitives (e.g., head, phrase, clause) and prosodic primitives (prosodic word, phonological phrase, intonational phrase, etc.) at an underlying level where the syntactic module hands off a structural representation to the prosodic module (Chomsky & Halle 1968, Selkirk 1995, 2011, Ito & Mester 2009). As an example, an isomorphic approach predicts that—barring the influence of other factors—(2a) should be the preferred prosodic form of (1) below, with all prosodic brackets deriving directly from underlying syntactic brackets.

The second perspective does not assume an obligatorily isomorphic relation between syntax and prosody (Wheeldon & Lahiri 1997, Lahiri & Plank 2010). Instead, under this view, prosodic phrasing is just as likely to be governed by entirely non-syntactic factors like stress prominence, metrical branching/weight, pressures from language production and perception, processing/parsing, etc. Of particular interest to this dissertation is the role of stress prominence at the word- and phrase-level in guiding the construction of a prosodic representation. (2b) illustrates a non-isomorphic phrasing based on word-stress (marked overtly with an acute accent):

(1) $[_{S}\ [_{NP}$ Susan] $[_{TP}$ has $[_{VP}$ driven $[_{PP}$ to Tucson]]]]

(2) a. ((Susan) (has (driven (to Tucson))))

b. (Súsan has) (dríven to) (Túcson)

I argue that both perspectives are necessary to account for a range of phonological and prosodic facts in English and related languages. In particular, I demonstrate that a stress-based approach is better-suited to account for principles of higher-level phonological phrase (φ) formation. In contrast, I show that an isomorphic theory of syntax/prosody is indeed necessary to account for properties of prosodic word (ω) formation and phrasal pitch accent assignment. I deploy the stress-based account of φ-phrasing to capture constraints on word-initial lenition and segment-deletion in English, both of which are allowed internal to φ but are prevented at the leading edge of φ ("domain initial strengthening"; Fougeron & Keating 1997). I also apply stress-based φ-phrasing to English complementizer-effects, demonstrating that the distribution of overt and null allomorphs of C is governed by the same prosodic principles governing word-initial lenition/deletion.

On the isomorphic side, I develop a model for syntax/prosody mappings within a Minimalist framework (Chomsky 2013, 2015) such that non-branching nodes (defined within Bare Phrase Structure) are targeted for ω-status and phrasal pitch accent assignment. I then apply this model to account for restrictions on vowel reduction in function words stranded in phrase-final position and to capture cases where phrasal pitch accents are subordinated on syntactic heads that combine with a complement. The latter account is then extended with assumptions about head-movement and linearization to address variation in pitch accent subordination between English and German, along with the non-licensing of phrase-final pronoun constructions with ditransitives, phrasal verbs, and resultatives in English.

1.1 Outline and Summary of Proposals

In the course of this dissertation, as noted, two different approaches to the relation between syntactic and prosodic form are evaluated, both of which make very different (and frequently contradictory) assumptions. Chapter 2 addresses frameworks embodied by "alignment" or "matching" constraints (McCarthy & Prince (1993), Truckenbrodt (1995), Selkirk (1996, 1999, 2011)), which assume a maximally direct (=isomorphic) relationship between syntactic and prosodic levels where, at an underlying level, syntactic primitives map directly into prosodic primitives and phonological boundaries (see also phase-based proposals like Selkirk & Kratzer 2007). In contrast, Chapter 3 discusses frameworks like those developed by Lahiri, Jongman & Sereno (1990), Gussenhoven (1993), and Lahiri & Plank (2010), which assume that syntax and prosody are mostly unentangled, and that prosodic structure is instead determined by domain-general principles of rhythm and meter. Ultimately, I conclude in Chapter 3 that these frameworks are complementary and that a full picture of the syntax-prosody relation can only be reached by incorporating aspects of both, despite their different theoretical and ideological commitments.

Along the way, the relation between three levels of prosodic organization is discussed for its relevance to the debate on the syntax-prosody mapping. This discussion addresses various phonological and prosodic phenomena in English, including segmental processes of vowel reduction, word-initial lenition/deletion, phrasal pitch accent assignment, and null/zero allomorphy. The first level corresponds to the level of the "prosodic word (ω)"; the second to the level of the "phonological phrase (φ)", and the third to the level of the "intonation phrase (ι)". Although these prosodic categories are typically ordered

hierarchically (ι > φ > ω), they will not be discussed in this order. Instead, the level of φ-phrasing is the focus of much of Chapters 2 and 3 due to its assumed correspondence with the syntactic level of the phrase/XP. The level of ω-formation is also addressed in Chapter 3.

I conclude on the basis of data from word-initial lenition/deletion that the process of φ-phrasing does not directly reflect syntactic phrasehood and is instead determined by surface level properties of stress prominence, with an account of stress-based phrasing being presented in section 3.3 of Chapter 3. I also argue on the basis of constraints on the reducibility of phrase-final function words and intrusive-[r] dialects that prosodic word formation is indeed determined in a direct manner by properties of syntactic structure, culminating in the "Prosodic Word Assignment Rule" (PWAR) in section 3.4, which maps prosodic words from non-branching nodes in a syntactic representation.

In Chapter 4, the attention shifts from the domain of segmental phonology to the domain of stress-prominence at the sentence-level, termed "phrasal stress". I show that phrasal stress provides further confirmation of the framework for syntax-prosody developed in Chapter 3. In particular, I examine the phenomenon of "prosodic subordination" (Wagner 2005, 2010, Truckenbrodt 2007, 2010), whereby phrasal stress assignment is suspended on the syntactic head of a head+complement configuration, and articulate a framework to account for this property in English and other languages where it manifests—the "Phrasal Stress Assignment Rule (PSAR)"—which parallels the PWAR of Chapter 3 in that it assigns phrasal stress to non-branching nodes in a syntactic representation. This account is then extended with assumptions about head-linearization and head-movement to account for optional vs. obligatory prosodic subordination and

additional constraints on the formation of higher-level prosodic domains like the "Major Phrase" (Kratzer & Selkirk 2007) to capture the phenomenon of non-local prosodic subordination and final-pronoun constructions in English.

In Chapter 5, the stress-based approach to phonological phrasing is combined with an understanding of prosodic phrasing at the sentence/clause-level (the third level of prosodic organization, ι-phrasing) and applied to the class of "complementizer effects" in English—in particular, the distribution of the null complementizer ("null-C"). I develop an account of null-C that relies on prosodic characteristics of syntactic configurations, concluding that null-C is licensed when C is not aligned to a leading prosodic boundary. This ties complementizer effects in to the larger realm of phonological phenomena discussed in Chapters 2 and 3; rules which respond to information from phonological phrasing, such as constraints on word-initial lenition/flapping (Selkirk 1999, Ito & Mester 2009) and segment-deletion (Zwicky 1970) and accords with experimentally-established tendencies toward domain-initial strengthening (Fougeron & Keating 1997, Cho & Keating 2001, Fougeron 2001, Keating, Cho, Fougeron & Hsu 2003, Keating & Shattuck-Hufnagel 2002, Keating 2003). This prosodic account adds to a line of prior research and proposals that take complementizer effects to be largely non-syntactic (Aoun et al. 1987, Culicover 1993, Richards 1999, De Chene 1995, 2000, 2001, Merchant 2001, Bošković & Lasnik 2003, An 2006, Kandybowicz 2007, Sato & Dobaishi 2012, etc.).

CHAPTER 2

MAPPING BETWEEN SYNTAX AND PHONOLOGY

This chapter addresses the question of how much syntactic information (if any) is relevant for the formation of prosodic/phonological domains. Prior proposals can be located on a spectrum with respect to this question, although many tend to cluster around a basic assumption of *isomorphy* between syntax and prosody at an underlying level, and these accounts will be the focus here. I review the basic theoretical background common amongst approaches to the relation between syntax and phonology/prosody, including the Prosodic Hierarchy, the Strict Layer Hypothesis, and a range of associated constraints. Ultimately, the goal of this chapter is to review prior isomorphic accounts through an examination datasets for English dialects, including word-initial aspiration/lenition, vowel reduction, and intrusive-[r] dialects in order to assess how effective such accounts are at explaining relevant patterns.

2.1 Introduction

Given any fully-formed sentence of English, as in (1) below, we can analyze the components of that sentence at various levels of detail. For example, it is broadly understood that the proper subparts of the sentence consist of sequences of phonological *segments*, represented phonemically in (1a-c). Those segments are also understood to be grouped into *syllables* (=1b), and syllables can be further organized into rhythmic units or *feet* (=1c).

(1) Susan visits Arizona.

a. /suzənvɪzɪtsærɪzonə/

b. /su.zən.vɪ.zɪts.æ.rɪ.zo.nə/

c. ('su.zən).('vɪ.zɪts).('æ.rɪ).('zo.nə)

These three levels of phonological organization are largely uncontroversial, but they alone do not suffice to account for the phonological properties of (1) and other sentences of English (or any language). It has long been assumed that *syntactic* information is also relevant for phonological representations, and a dominant thread of research has taken this assumption to be nearly axiomatic (Selkirk 1984, 1995, Nespor & Vogel 1986, Truckenbrodt 1995, 1999, 2007, and many others; see Elordieta 2008 and Selkirk 2011 for detailed overviews). Two examples illustrate the role of syntactic information:

First, words show varying phonological properties based on their syntactic category. The sentence in (2) below consists of "lexical" categories (nouns, verbs) and "functional" categories (auxiliary verbs, determiners, prepositions). The latter, but not the former, may undergo certain types of phonological reduction.

(2) Susan_{N} has_{Aux} hopped_{V} a_{D} bus_{N} to_{P} Tucson_{N}.

Compare the auxiliary verb *has* with the lexical verb *hopped*. The former may reduce to [əz] or even to [z], while the latter may not be reduced in a parallel way, even in fast-paced speech. Likewise, the preposition *to* is subject to both vowel reduction ([u] > [ə]) and lenition ("flapping") of the word-initial obstruent /t/ = [ɾ], while the first syllable of the lexical noun *Tucson* is immune to both of these processes. Additionally, the processes of vowel reduction and lenition which may apply to functional categories are separate

and distinct from each other. When the preposition *to* is stranded in a "phrase-final" position (=3), it may no longer undergo vowel-reduction, but lenition is still possible.

(3) It was Tucson that Susan hopped a bus to. *to* = [ɾu]/*[ɾə]

A second phenomenon involves the assignment of pitch-accents. When a sentence is pronounced with broad/neutral focus intonation, pitch-accents are assigned to lexical categories. Some of these accents are obligatory, as in the case of *Susan* and *Arizona* in (4) below; others are optional, as in the case of *visited*. This is not a lexically-specified fact, as can be seen in (5), where *visited* receives an obligatory pitch-accent in the presence of a following pronoun.

(4) Susan visited Arizona.
H* (H*) H*

(5) Susan visited them in Arizona.
H* H* H*

In both of the contexts discussed here, it appears that phonological and prosodic properties of the string are determined by referencing information provided by the syntax: syntactic categories (lexical vs. functional) and syntactic position in the case of vowel-reduction; following phrasal-status in the case of pitch-accent assignment. These phenomena have served an important role in arguments for the existence of a direct relation between syntax and systems of phonology and prosody. Nevertheless, the specific points of contact between these two systems remain open for debate.

In this chapter, I review phonological and syntactic data that has been used to justify specific accounts of the relation between prosody and syntax and expand on those empirical domains to make conclusions about a theoretical framework that can successfully capture generalizations in the data. Two contrasting approaches to

syntax/prosody are distinguished. The first approach is termed the "isomorphic approach" and will be the main focus of this chapter. It is represented in work by Selkirk, Nespor & Vogel, and Truckenbrodt cited above. The basic assumption of these accounts is that prosodic organization tends to reflect syntactic constituency. The second approach, which will be the subject of Chapter 3, is termed the "non-isomorphic approach" and is embodied in proposals by Wheeldon & Lahiri (1997) and Lahiri & Plank (2010), although it follows a thread of literature tracing back to the late 1800s. The non-isomorphic approach assumes that the relation between syntax and prosody is much more indirect and that prosody is largely determined by domain-general principles of rhythm and meter in language production, yielding prosodic structures which may radically violate syntactic constituency.[1]

These differing initial commitments directly influence the kinds of principles, constraints, and representations postulated by each account. As an example, because the isomorphic approach assumes that prosodic grouping reflects syntactic constituency, it predicts that, in a head-initial language like English, functional categories (Fnc) should be *pro*clitic upon lexical categories (Lex) by default, as in (6a). In contrast, the non-isomorphic approach does not make such a prediction. Functional categories could be either proclitic (=6a) or *en*clitic (=6b) based on other (possibly non-syntactic) factors. As will be shown in Chapter 3, there is in fact good evidence that functional categories in

[1] A subtype of the isomorphic perspective can also be distinguished where prosodic constituency influences syntactic constituency. In other words, under such an approach, the typical relation between syntax and prosody is flipped, with prosodic constraints determining the application of syntactic operations. Such an approach is represented in Richard's "Contiguity Theory" (2014), where a prosodic and phonological relation of "contiguity" enforces specific syntactic (re-)orderings. A detailed assessment of this approach is beyond the scope of this work, and so I will not address the notion of contiguity further, but see Section 2.3.3 below for a discussion of the isomorphic prosodic framework of "Match Theory" (Selkirk 2011) which Richards incorporates for basic syntax-prosody mappings.

English (and Germanic languages in general) tend to be strongly enclitic, violating syntactic constituency.

(6) [Lex [Fnc Lex]]

a. (Lex) (Fnc Lex)

b. (Lex Fnc) (Lex)

The goal of the present chapter is to review the history of isomorphic approaches to the relation between syntax and phonology/prosody. The chapter is organized as follows: section 2.2 reviews basic theoretical concepts and assumptions common to many isomorphic theories, including elements of the "Prosodic Hierarchy" and associated constraints. Section 2.3 reviews a range of prior theoretical accounts and presents the datasets upon which they are constructed, illustrating some major successes and failures. Section 2.4 concludes the chapter.

2.2 Background on Syntax-Prosody

2.2.1 Early Developments

The history of isomorphic frameworks begins with work by Chomsky & Halle (1968) and Selkirk (1972), focusing on the assignment of phonological "boundaries". Chomsky & Halle (1968:367-368) adopt the classic notion that syntax assigns a "surface structure" to each sentence which is then accessible to the phonological component. At this level, individual words dominated by a major lexical category (noun, verb, etc.), as well as higher level phrasal categories (NP, VP, sentence, etc.), are flanked by *boundaries* #. Thus, the sentence in (7), repeated from (2) above, has the simplistic surface structure in (7a) and receives the boundary-marked phonological form in (7b). Stripping away the

syntactic bracketing, we are left with (7c) to illustrate the different boundary-strengths mapped from surface structure.

(7) **Susan has hopped a bus to Tucson.**

a. [$_{S}$ [$_{NP}$ [$_{N}$ Susan]]] [$_{VP}$ has$_{Aux}$ [$_{VP}$ [$_{V}$ hopped] [$_{NP}$ a$_{D}$ [$_{N}$ bus]] [$_{PP}$ to$_{P}$ [$_{NP}$ [$_{N}$ Tucson]]]]]

b. [$_{S}$ #[$_{NP}$ #[$_{N}$ #Susan#]#] [$_{VP}$ #has$_{Aux}$ [$_{VP}$ #[$_{V}$ #hopped#]# [$_{NP}$ #a$_{D}$ [$_{N}$ #bus#]#] [$_{PP}$ #to [$_{NP}$ #[$_{N}$ #Tucson#]#]#]#]#]#]

c. ### Susan ### has ## hopped ### a # bus ### to ## Tucson ######

Further adjustment rules may also apply to eliminate extra boundaries introduced by multiple intermediate syntactic projections (see Selkirk (1972:13) and discussion by Elordieta (2008:213)), but (8c) suffices to understand the principle of the system. In general, stronger syntactic breaks (3 or more brackets) will correlate with stronger prosodic breaks, and the strength of junctures between domains is relevant for allowing or blocking phonological rules (see also Wagner 2005, 2010). This is the core of the isomorphic approach to syntax/prosody: syntactic structure is the basis upon which the phonological boundaries are inserted, the starting point for a phonological representation. This is true even though proponents of this framework are careful to maintain that the boundaries inserted are of a phonological nature and that phonological rules do not, therefore, directly reference syntactic boundaries. Elordieta (2008), for example, argues that both the boundary-based approach and its descendants are not actually isomorphic, based on this fact. She quotes Selkirk's (1972:10) statement that "[phonological rules]… do not refer to phrase structure" to support this.

The issue is simply a matter of notation, however. Defining boundaries like # as "phonological" rather than syntactic ultimately makes no substantive difference. The boundaries in (8b-c) are directly derived from syntactic bracketings, and therefore the theory built upon this assumption is isomorphic, if not in word, then in deed. This is further emphasized by Selkirk herself in the continuation of the above quote (emphasis mine): "**The number and kind of boundaries separating words in a string may have been determined by readjustment rules which are sensitive to phrase structure** […], but the [rules] mention only sequences of segments and boundaries in their structural descriptions." (1972:10). Ultimately, the definition of syntax/prosody isomorphy that is important to this work is not concerned with the structural description of phonological rules. It is concerned with whether or not there is a direct relation *at some level* between syntactic structure (categories, projections, nodes, bracketings, etc.) and prosodic structure. Within the relational model and the models which follow it, the assumption is that this direct relation does indeed exist, and as a result, syntactic structure plays an important organizing role for prosody.

2.2.2 The Lexical/Functional Divide

I will now examine some of the basic principles of the isomorphic view at this early stage. First, consider the treatment of the functional/lexical divide that is implicit in Chomsky & Halle's formulation of boundary-insertion (applied in (8) above). The definition of boundary-insertion specifically targets "lexical categories" and ignores functional categories (1968:366). In application, this means that functional categories are not flanked by an additional set of word-boundaries, and, as a consequence, they tend to

be incorporated into adjacent phonological domains formed on the basis of lexical categories.

Furthermore, under these assumptions, the juncture between a functional and a lexical word is significantly weaker than the juncture between a lexical word and another lexical word/phrase. At first glance, this seems to fit the facts, if we correlate the strength of a phonological boundary with the likelihood of a phonological rule applying across that boundary. Selkirk (1972:183-185) points to data from regressive assimilation of nasals in English to illustrate. As shown below, nasals may assimilate in place to the segment that follows them when they are word-internal (=8), and the same process may also apply across the juncture between a functional item (here a preposition) and a following lexical item (=9). However, nasal-assimilation is much less acceptable across the juncture between a lexical item and a following word (=10).[2]

(8) a. pancake [ŋk], congress [ŋg]

b. tenpence [mp], compare [mp]

(9) a. in Colorado [ŋk]

b. in Boise [mb]

(10) a. John banked at the Case Manhattan. ?[mb]

b. Would they loan Carnegie ten million? ?[ŋk]

This is not a general rule, however, and many processes of regressive assimilation apply across junctures between lexical items and following words in English and other

[2] Speakers I have consulted vary in their acceptability judgements for these cases. I personally find (10a) to be somewhat degraded, while (10b) is not bad. In addition, relative stress-prominence affects acceptability. Thus, when *John* in (10a) is de-emphasized in relation to *banked*, assimilation is better, but not if both *John* and *banked* are equally stressed. This fits with the assessment below that facts on regressive assimilation are not definitive for determining the strength of phonological boundaries derived from syntactic bracketings.

languages. For example, Koster (1987) investigates patterns of regressive place assimilation in English for contexts like *sweet girl*, where word-final [t] may be realized as [k] (see Gaskell & Marslen-Wilson 1996, 1998 for further examples). Other studies have found similar patterns of regressive assimilation across word-boundaries in Dutch (Kuijpers & Van Donselaar to appear), and Japanese (Otake et al. 1996). It should also be noted that Selkirk's generalization for nasal assimilation in lexical words is not absolute. Consider *fun camp*, one of the assimilation-pairs used by Gaskell & Marslen-Wilson (1998). In this case, speakers judged assimilation of [n] to [ŋ] across the juncture between the two lexical words to be fully acceptable. Thus, while the contrasts in (8)-(10) may exist to some degree, they are not enough on their own to substantiate an isomorphic relation between the syntactic phrasing of functional and lexical items and their prosodic phrasing.

Before moving on, let us reiterate that the boundary-based model defines the lexical/functional divide in terms of where word boundaries are placed by the algorithm that maps from surface structure to the phonological component, with functional words lacking the dedicated set of flanking boundaries that lexical words receive. As originally defined by Chomsky & Halle, this does not seek to explain *why* functional categories have the properties that they do, only that the lexical/functional divide is visible in the surface structure. Ideally, an isomorphic theory of syntax/prosody would provide us with an explanation of *why* the underlying distinction between functional and lexical categories leads to functional categories being less phonologically robust than lexical words. With this in mind, we arrive at the core data that was briefly introduced in section

2.1 above: the fact that functional and lexical words are targeted differently by processes of phonological reduction.

Monosyllabic functional words in English have both a "strong form" where the phonological representation is fully articulated and a "weak form" where that representation is reduced. This observation goes back at least to Sweet (1891), later Jones (1964), Gimson (1970), and King (1970).[3] This aspect of the lexical/functional divide is shown in detail by the minimal pairs in (11)-(13), where the (a)-sentences show that a functional category can undergo vowel reduction and the (b)-sentences shows that an otherwise homophonous lexical category cannot undergo such reduction.

(11) a. Susan went **to** rounds of golf last week. *to* = [tu], [tə]

b. Susan went **two** rounds of golf last week. *two* = [tu], ***[tə]**

(12) a. Susan worked **for** eight-hour shifts. *for* = [for], [fər]/[fɻ]

b. Susan worked **four** eight-hour shifts. *four* = [for], ***[fər]/[fɻ]**

(13)[4] a. Kurt and Susan **can** jam all day. *can* (aux.) = [kæn], [kən]/[kn̩]

b. Kurt and Susan **can** jam all day. *can* (v.) = [kæn], ***[kən]/[kn̩]**

As mentioned, the manifestation of strong or weak forms appears to be constrained by the syntactic environment, phrase-final position vs. other positions (=14).

(14) a. I attended a round that Susan went **to** *to* = [tu], *[tə]

b. I was hired by the company Susan worked **for** *for* = [for], *[fər]/[fɻ]

[3] In English, the class of functional words includes (at least) determiners, verbal auxiliaries, prepositions, pronouns, complementizers, and coordinators, while lexical words include nouns, verbs, adjectives, adverbs, and potentially some verbal particles.

[4] (13a) paraphrases as "Kurt and Sue are able to play their instruments all day", while (13b) paraphrases as "Kurt and Sue preserve delicious jams all day".

c. Kurt might, but I know Susan **can** *can* = [kæn], *[kən]/[kn̩]

d. Kurt might be happy, but I know Susan **is** *is* = [ɪz], *[z] (> -*'s*)

A related piece of evidence involves patterns of [r]-sandhi in "intrusive-[r]" dialects of English. McCarthy (1991, 1993) notes that [r] is inserted as a hiatus-breaker between low and reduced vowels at the juncture between two words as long as the first word is a lexical category.

(15) a. raw**[r]** apples

b. law**[r]** and order

c. Pamela**[r]** Anderson

(16) a. *Take the**[r]** apples.

b. *Give it to**[r]** Andy.

c. *Jane was gonna**[r]** ask them.

The only exception is when a functional item precedes the juncture and that functional item is "phrase-final" in the same way that functional items are irreducible when phrase-final.

(17) a. I said Jane was gonna**[r]** and she did.

b. I said Jane oughta**[r]** and she did.

c. I said Jane would hafta**[r]** and she did.

What this shows is that two different phonological rules—one a rule of vowel-reduction and the other a sandhi-rule—treat functional items in specific structural configurations as if they had the prosodic status of lexical items. In subsequent work, however, this parallel has not been emphasized as such. What we should conclude from this data is that functional items are not simply inherently coded as "functional" with

associated phonological properties. Instead, functional items have the properties that they do because they usually fall into specific positions or configurations due to syntax. Thus, the claim that will be defended and developed here is that there is not an inherent prosodic difference between functional and lexical items, but there is a prosodic difference that stems from the different configurations in which functional and lexical items are found, and these different configurations can be explained by deeper properties of the syntax.

In order to transition into a discussion of syntax-prosody developments beyond the boundary-based model, let us consider how this model deals with the data on vowel-reduction above. Selkirk (1972) proposes the following "Monosyllable Rule":

(18) **Monosyllable Rule:** A monosyllabic dependent loses its stress when it precedes its head or a co-dependent in surface structure.

The term "dependent" is defined as a non-lexical (i.e. functional) category, which in early phrase structure occupied the "specifier" position of a larger phrase: [$_{NP}$ **D** [$_{N}$ noun]], [$_{VP}$ **Aux** [$_{V}$ verb]]. The formulation in (18) provides a description of the phenomenon under discussion—complete with a caveat for the "phrase-final" cases—and further work has refined the rule significantly. With this in mind, we turn to the next phase in the framework of prosody which formulates a widely influential set of primitives and principles for understanding prosodic structure and phonological domains.

2.2.3 The Prosodic Hierarchy

Work by Selkirk (1980, 1984), Nespor & Vogel (1986), and Hayes (1990) extends many of the basic observations of Chomsky & Halle (1968) and formalizes a common point of agreement across frameworks; namely, the assumption of the hierarchical nature of

prosodic organization. This can be seen in the basic sequence of segment > syllable > foot discussed briefly in section 2.1—what Féry (2016:8) terms the "rhythmic constituents"—and it extends to higher levels of prosody as well. Thus, a significant number of accounts commit, at minimum, to the existence of a formalized "Prosodic Hierarchy" (PH): a finite set of hierarchically organized prosodic categories from which prosodic representations (typically trees) are built and which together define the domains in which phonological rules apply. A standard representation of the hierarchy is as follows (Selkirk 1978, 1986; Nespor & Vogel 1986, Beckman & Pierrehumbert 1986, Pierrehumbert & Beckman 1988):

(19) a. Utterance (υ)

b. Intonation Phrase (ι)

c. Phonological Phrase (φ)

d. Prosodic Word (ω)[5]

e. Foot (f)

f. Syllable (σ)

g. Mora (μ)

The hierarchy is frequently paired with a set of wellformedness conditions, some of which differ in their potential for violability. These conditions form the "Strict Layer Hypothesis (SLH)" (Selkirk 1984, 1996; Nespor & Vogel 1986). The definitions below are adapted from Selkirk (1996):

[5] An additional level of "Clitic Group (CG)" is frequently added, although it is not relevant here. See Hayes (1989) for its initial postulation, along with discussion and criticism by Booij (1996), Peperkamp (1997), and Vigário (1999, 2003).

(20) a. **Layeredness:** No prosodic category dominates a category from a higher level.

b. **Headedness:** Every prosodic category has a "head", a category of the next lower level which it dominates.

c. **Exhaustivity:** Every prosodic category dominates only prosodic categories of the next lower level.

d. **Nonrecursivity:** No prosodic category dominates a prosodic category of the same level.

The application of these conditions excludes various logically possible prosodic structures. For example, Ladd (1996:239) notes that the SLH rules out representations with multiple domination (domination of a single category by multiple higher categories), heterogenous sisters (categories of different levels dominated by the same category), level-skipping (domination of one category by a category that is not immediately above it in the hierarchy), and recursion (domination of one category by an identical category). However, it should be noted that because, when the SLH is stated within the framework of Optimality Theory, the conditions are considered to be ordered, ranked, and possibly violable (McCarthy & Prince 1993, Truckenbrodt 1995, 1999, 2002; Selkirk 1995, 2000).

The PH formulates a new set of primitives and domains for the application of phonological rules (Selkirk 1980**), and the principles of the SLH echo, in many ways, constraints on syntactic phrase-structure. Furthermore, the PH provides a clearer presentation of how the isomorphic view is applied. Nespor & Vogel (1986), for example, define the prosodic word as a mapping from (at minimum) a terminal element in a syntactic tree containing a stem and local affixes.

The focus here is on the manifestation of the lexical/functional divide in syntax-prosody and how this illustrates the underlying commitments of proposed frameworks. Thus far, the lexical/functional divide has been presented as an important part of the mapping between syntax and phonology, but an explanation of why different prosodic effects manifest along this divide remains absent. Frequently, a stipulation is incorporated such that the algorithm which forms phonological domains simply ignores functional categories but not lexical categories, leaving functional words to be incorporated into domains that are centered around lexical words. To exemplify this, Selkirk (1984:226) addresses the lexical/functional divide explicitly in mapping out the relation between syntactic structure and the organization of the PH by formulating the "Principle of Categorial Invisibility of Function Words", later recapitulated by Truckenbrodt's (1999:226) "Lexical Category Principle" which explicitly states that functional material in the syntax is not taken into consideration for the assignment of prosodic domains.

The incorporation of the PH transitions seamlessly into proposals by Selkirk (1986) and Chen (1987) which take edges of domains as defined within the hierarchy to be important for capturing variation in the application of phonological rules. Under this *end-based* approach to syntax-prosody, phonological domains are marked off by the left or right edges of different syntactic constituents; namely, syntactic heads and phrases. The different options for this demarcation are assumed to be subject to parametric variation, with some languages choosing to begin or end a domain before/after a head, before/after a phrase, or some combination of the two.

As an example, consider the following observations: In English, a prosodic break or pause (="#" in (21a) below) can be optionally inserted between the subject phrase of a

sentence and the verb phrase, but a similar pause cannot be inserted between a verb and its object.

(21) **[$_{DP}$ Susan] [$_{VP}$ visited [$_{DP}$ Toronto]]**

a. Susan (#) visited *(#) Toronto.

b. Susan)$_{\varphi}$ visited Toronto)$_{\varphi}$)$_{\varphi}$

Using end-based parameters, English can be characterized as aligning phonological phrase boundaries (φ) to the right edges of syntactic phrases, as in (21b), meaning that a subject DP, object DP and VP will all be assigned φ-boundaries at their right edges (the latter two of which will collapse), but no boundary will be inserted between V and DP. Selkirk & Tateishi (1988) apply similar end-based assumptions to Japanese, Selkirk & Shen (1990) to Chinese, and Kenstowicz & Sohn (1997) to Korean, with varying degrees of success.

With the rise of Optimality Theory in the early '90s, the edge-matching parameters of the end-based approach were translated into violable ranked constraints governing the alignment of the edges of prosodic and syntactic categories, beginning with the development of *Generalized Alignment* by McCarthy & Prince (1993), formulated in (22) below:

(22) **Generalized Alignment**

Where *Cat$_1$*, *Cat$_2$* are prosodic, morphological, or syntactic categories and *Edge$_1$*, *Edge$_2$* ∈ {Right, Left}:

ALIGN(Cat$_1$, Edge$_1$; Cat$_2$, Edge$_2$) ⇔

For each *Cat$_1$* there is a *Cat$_2$* such that *Edge$_1$* of *Cat$_1$* and *Edge$_2$* of *Cat$_2$* coincide.

Generalized Alignment defines a range of ALIGN constraints requiring that the left or right edges of certain syntactic constituents match up with the left or right edges of certain prosodic constituents (McCarthy & Prince 1993b** 1994, Selkirk 1995, 2000). Other types of constraints include WRAP constraints requiring syntactic constituents to be fully enclosed in phonological domains, such as syntactic phrases being enclosed in phonological phrases (Truckenbrodt 1995, 1999), and most recently MATCH constraints (Selkirk 2011) which no longer refer to ends/edges and instead map directly between levels of syntactic categories (head, phrase, sentence, etc.) and prosodic categories (prosodic word, phonological phrase, intonation phrase, etc.). These constraints differ from the previous end-based approach because the framework of OT allows for variation in whether or not the constraints are obeyed or violated. Prosodic variation is therefore seen as a result of specific rankings of constraints, rather than a selection from a set of parameters.

The shared assumption of an underlying isomorphic relation between syntactic and prosodic units influences the understanding of the lexical/functional divide within the foregoing frameworks. To illustrate the role of isomorphy in these syntax/prosody frameworks, the next section examines influential proposals made by Selkirk (1996) for the organization of functional and lexical material within a framework incorporating the PH, the SLH, and a set of ranked alignment constraints.

2.3 Prior Isomorphic Accounts

2.3.1 (Ir)reducibility of Function Words (Selkirk 1996)

Selkirk (1996) takes into consideration the data on (non-)reduction of functional items and evidence from intrusive-[r] dialects discussed above and adds some additional cases

where functional items may not be reduced; namely, environments where a functional word is independently focused, receiving a strong pitch-accent (=22), and instances of functional words uttered in isolation, as in a coordinated list (=23).

(22) Sue HAS visited Arizona.

(23) *to, for, has, is*…

Selkirk makes the following claims: focus involves the assignment of strong prominence to a word, and strong prominence is taken to be a property of higher-level prosodic categories such as the phonological phrase. Thus, when a functional word is independently assigned focus-prominence, it is forced to be parsed as a higher-level prosodic constituent, as well as all constituent-types dominated by that constituent (ω, f, etc.) by the SLH. Thus, *HAS* in (22) would be prosodically parsed as in (22'):

(22') Sue ($_{\varphi}$ ($_{\omega}$ ($_{f}$ HAS))) visited Arizona

In the case of (23), single-word utterances still count as prosodic units of the Utterance type υ, and, according to the SLH, an item parsed into the prosodic category of υ must also be parsed into every category dominated by υ (ι, φ, etc.). (23') shows the parsing for the list of functional items from (23).

(23') ($_{\upsilon}$ ($_{\iota}$ ($_{\varphi}$ ($_{\omega}$ ($_{f}$ to))))), ($_{\upsilon}$ ($_{\iota}$ ($_{\varphi}$ ($_{\omega}$ ($_{f}$ for))))), ($_{\upsilon}$ ($_{\iota}$ ($_{\varphi}$ ($_{\omega}$ ($_{f}$ has))))), ($_{\upsilon}$ ($_{\iota}$ ($_{\varphi}$ ($_{\omega}$ ($_{f}$ is))))…

Setting these aside, Selkirk next turns to cases where functional items are reduceable; in particular, when they precede an associated lexical category. Selkirk lists four possibilities for the incorporation of functional items:

(24) [to$_{Fnc}$ Tucson$_{Lex}$]

a. ($_{\varphi}$ ($_{\omega}$ to) ($_{\omega}$ Tucson)) “full prosodic word”

b. ($_{\varphi}$ to ($_{\omega}$ Tucson)) “free clitic”

c. (φ (ω to Tucson)) “internal clitic”

d. (φ (ω to (ω Tucson))) “affixal clitic”

The first option is to assign both the lexical and functional item the status of a full ω. The second option (24b) is to leave the functional item unparsed as a ω but incorporate it into the same domain as the lexical item by including it in the higher domain of the φ. The third and fourth options also involve leaving the functional item unparsed as a ω, but incorporating it into the ω formed on the basis of the lexical item: fully internal to that ω in the case of (24c) or incorporated into a recursive “projection” of that ω (=24d).

Selkirk eventually settles on (24b) as the correct form, arguing that functional items are “free clitics” which are attached outside of the ω parsed for a lexical item but inside the φ of which that prosodic word is the head. (24a,c,d) are all ruled out based on additional evidence from constraints on the absence of aspiration on word-initial stops, which Selkirk observes is not typically allowed at the beginning of ωs. She thus concludes that functional items must not be aligned to the left edge of ω, and are instead outside of ω, but inside φ (we return to the data on aspiration below).[6] Thus, as “free clitics”, functional items act as free-floating phonological material that is related to lexical items indirectly by incorporation into a higher domain. Selkirk develops the following set of constraints to achieve this result (1996:49):

(25) **ALIGN(X_{Lex}, L; ω, L):** For each lexical category X, there is a ω such that the left edge of X coincides with the left edge of ω.

(26) **ALIGN(X_{Lex}, R; ω, R):** For each lexical category X, there is a ω such that the right edge of X coincides with the right edge of ω.

[6] (24d) is also independently ruled out because it violates the SLH’s ban on recursion of prosodic categories—(20d) above, which Selkirk adopts—with a recursive prosodic word.

These two high-ranking constraints result in a requirement that lexical words be parsed into ωs (and feet, syllables, etc.).

(27) $[_N$ Susan $_N]$ $[_V$ visits $_V]$ $[_N$ Arizona $_N]$

ω: ( ) ( ) ( )

In addition, Selkirk proposes two other alignment constraints to capture the treatment of functional items in "phrase-final" position. The first targets the right edge of maximal projections of lexical words, requiring them to be aligned to the right edge of a φ. The second is a special type of constraint that requires alignment between two prosodic categories—the right edge of φ and the right edge of ω—rather than a syntactic category and a prosodic category. The result is that phrase-final functional categories are forced to parse into at least a ω (foot, syllable…) in order to satisfy the constraint.

(28) **ALIGN(XP, R; φ, R):** For each XP, there is a φ such that the right edge of XP coincides with the right edge of φ.

(29) **ALIGN(φ, R; ω, R):** For each φ, there is a ω such that the right edge of φ coincides with the right edge of ω.

The satisfaction of both of these constraints is illustrated in (30) below[7]. (31) and (31') illustrate the interaction of these constraints for instances of phrase-final functional items.

(30) $[_{NP}$ Susan$_N$ $_{NP}]$ $[_{VP}$ visits$_V$ $[_{NP}$ Arizona$_N$ $_{NP}]$ $_{VP}]$

ω: ( ) ( ) ( )

φ: ( ) ( )

[7] Note that adjacent recursive brackets in the syntactic representation $_{XP}]$ $_{YP}]$ may be aligned with a single prosodic boundary, satisfying generalized alignment requirements.

(31) [$_{NP}$ What$_{D}$ state$_{N}$ $_{NP}$] did$_{Aux}$ [$_{NP}$ Susan$_{N}$ $_{NP}$] [$_{VP}$ go$_{V}$ to$_{P}$ $_{VP}$]?

ω: ( ) ( ) ( ) **( )**!! **=(29) satisfied**

φ: ( ) ( ) ( )

(31') [$_{NP}$ What$_{D}$ state$_{N}$ $_{NP}$] did$_{Aux}$ [$_{NP}$ Susan$_{N}$ $_{NP}$] [$_{VP}$ go$_{V}$ to$_{P}$ $_{VP}$]?

ω: ( ) ( ) ( )

φ: ( ) ( ) (**)**!! **=(29) violated**

If the preposition *to* were not parsed at minimum as a ω, as in (31), it would violate the alignment constraint (29) requiring the right edge of every φ (the φ aligned with VP, in this case) to coincide with the right edge of a ω. This provides the motivation for obligatory parsing of a functional category into a higher prosodic category such that it may no longer undergo phonological reduction (=31').

Notably, all four of the proposed structures in (24) make the assumption—without further comment—that functional words in English are proclitic by default, and indeed that proclitic structures are the only options available. Crucially, a proclitic structure for functional items would mirror the head-initial syntactic property of English in an isomorphic fashion. As such, Selkirk's proposal is highly pertinent to the discussion of isomorphy between syntax and prosody. If we presuppose that isomorphy between these two systems is the simplest assumption, as Selkirk does, we will be led to assume that certain kinds of mapping principles are allowable, while others are not. Ultimately, Selkirk arrives at this treatment of functional items as "free clitics" (=24b) by appealing to data from aspiration/lenition of word-initial stops in English. Leaving aside additional arguments, like the ban on recursion, which are made on a conceptual basis via principles like the SLH, the data from aspiration/lenition stand as the primary motivation for

Selkirk's isomorphic proclitic analysis. In the next section, I examine this important dataset in detail contrasting it with proposals by Ito & Mester (2009).

2.3.2 Word-Initial Lenition/Flapping (Ito & Mester 2009)

As briefly mentioned in section 2.1, it has been consistently observed that in English functional categories with word-initial voiceless stops (/p, t, k/) can undergo lenition, manifesting as loss of aspiration [p^h, t^h, k^h] → [p, t, k] or "flapping" in the case of alveolar stops [t^h] → [ɾ]. This process also applies in non-initial unstressed syllables generally, irrespective of lexical/functional status (*pity* ['pi.**ɾ**i], *after* ['æf.**ɾ**ər]). However, voiceless stops in word-initial position of lexical words specifically are not subject to this process, regardless of the stress of the initial syllable (see Cooper 1991, 1994).

(32) **Susan drove to Tucson.**

a. Susan drove [t^h]o [t^h]ucson

b. Susan drove [ɾ]o [t^h]ucson

c. *Susan drove [t^h]o [ɾ]ucson

d. *Susan drove [ɾ]o [ɾ]ucson

Selkirk (1996) takes this limit on the domain of lenition to be another example of a constraint associated with the domain of the prosodic word and assumes that segments which initiate prosodic words may not undergo lenition/deaspiration/flapping. With this established, the different possibilities for prosodification of functional items in (24) becomes clear. Functional items cannot be prosodic words themselves (=24a), since this would preclude lenition because the initial segment of the functional item would align with the initial boundary of the prosodic word. For the same reason, functional items cannot be incorporated into another prosodic word domain (=24c,d).

Additional data complicates this picture. Ito & Mester (2009) (henceforth I&M) criticize Selkirk's proposals by noting that it amounts to a constraint against lenition at the initial boundary of the prosodic word ($_{\omega}$. They note, however, that lenition is also prohibited elsewhere; namely, at the initial boundary of all other prosodic domains, such as the utterance (33a) and intonation phrase (33b):

(33) a. Where did Susan drive? – To Tucson.

b. I will drive, Susan said, to Tucson.

= [t^{h}]o/*[ɾ]o [t^{h}]ucson

I&M use this data to develop an influential alternative to Selkirk's account based on the assumption that the SLH principle of non-recursivity is not absolute, and that the constraint against recursive prosodic structures is violable. They argue that a recursive prosodic word structure fits the facts in (32)-(33) better, represented in (24d) above and repeated as (34) below.

(34) ($_{\varphi}$ ($_{\omega}$ to ($_{\omega}$ Tucson))) "affixal clitic"

Within this system, the different levels of the PH are still distinguished, but each may be divided into an unbounded number of intermediate levels. Three types of recursive levels are established in each case: a "minimal" level which immediately dominates no identical prosodic categories, a "maximal" level which is immediate dominated by a prosodic category different from itself, and an unbounded number of "intermediate" levels which dominate and are dominated by identical prosodic categories. This approach to prosodic structure directly reflects early principles of Bare Phrase Structure (Chomsky 1995), which sought to eliminate stipulative restrictions on the configuration of phrases characteristic of earlier X-Bar Theory and define the status of different syntactic levels

and projections in a relational way. Bare Phrase Structure generally distinguishes minimal and maximal levels of structure, with unbounded intermediate projections.

Applying the recursive approach to prosodic structure to the data on aspiration, I&M formulate a distinction between "crisp" and "non-crisp" edges of prosodic constituents, wherein the former type of edge resists weakening processes like lenition while the latter type allows them. Implicit within this approach is the conclusion that a "crisp" edge correlates with the left/leading edge of a *minimal* prosodic category—in this case a minimal ω (see also Ito & Mester 1999). Thus, lenition/flapping will be prohibited on segments that align with this position.

(35) Susan drove ($_{\omega\text{-max}}$ [ɾ]o ($_{\omega\text{-min}}$ [t^h]ucson))

Crucially, however, I&M's account of constraints on lenition do not answer their own objection to Selkirk's (1996) account; namely, the question of why the intermediate/maximal levels of prosodic words would allow lenition, when such a process is disallowed at the leading edge of all other categories (υ, ι, ω_{min}). In essence, they trade out Selkirk's idea that lenition is allowed at the leading edge of φ for the idea that lenition is allowed at the leading edge of maximal/intermediate-ω. This is nothing more than a change in notation, regardless of the much larger theoretical shift that allowing recursion of prosodic categories signals.

The root of this problem is to be found in the influence of syntax/prosody isomorphy that is implicit in both of these accounts. As mentioned, all of the possibilities for prosodification of functional items proposed by Selkirk (1996) and adopted by I&M, among numerous others, involve the assumption that, in English, functional categories are *proclitics*, reflecting their head-initial syntactic structure isomorphically. This

assumption is implicit in all of Selkirk's discussion, and it is taken as common sense by I&M. A discussion of I&M's proposals for the treatment of the irreducibility of phrase-final functional categories, which contrasts with Selkirk's (1995) proposals, brings this assumption to the forefront.

I&M do not adopt Selkirk's right-alignment constraints on XP/φ and φ/ω on the grounds that these are primarily descriptive, asserting what is found in the data without explaining why it occurs. In examining data like (36) (their (46)), they note that the most natural way for phrase-final functional items to be incorporated into prosodic structure would appear to be for them to be incorporated leftward as enclitics, absorbed into the ω-structure of lexical items which precede them, rather than being parsed as separate ωs. However, I&M reject this possibility on principle due to the "general proclisis pattern of English" (2009:164), as shown in (36a):

(36) **What did you look at yesterday?**

a. *(φ … (ω look at)) (φ (ω yesterday))

b. *(φ … (ω look) (φ at (ω yesterday))

c. *(φ … (ω look) at) (φ (ω yesterday))

d. (φ … (ω look) (ω at)) (φ (ω yesterday))

The assertion of default proclisis which rules out (36a) is followed up in a footnote: "As is well known, the overwhelming default in English is proclisis, not enclisis, in line with the general syntactic pattern of the language" (I&M 2009:164, fn.24). Notably though, in this same quote, the authors cite a specific case where enclisis is absolutely assumed in English: pronominal objects like *gimme, got'm*, and *need'm*. They dismiss these by appealing to Selkirk (1984:383-406, 1995:459-460) where these examples are

treated as exceptional cases with distinct morphosyntactic properties. Having ruled out by stipulation the possibility of enclisis, along with proclisis (=36b), due to the fact that this would violate proper bracketing by incorporating a functional item into a following φ, the only choice left is for functional items to be parsed as independent ωs (=36d), satisfying the highly-ranked constraint PARSE-INTO-ω, which requires that as much phonological material be parsed into ωs as possible. (36c) is ruled out due to the fact that, if a functional item were left unparsed as a ω and were simply incorporated into the higher φ, reducibility would be predicted, hence the need for a PARSE-INTO-ω constraint.

To recap, we have seen examples of theoretical proposals from a position that is strongly influenced by the assumption of underlying isomorphy for syntax/prosody. Ultimately, the proposals made either do not clearly capture the facts of the lexical/functional divide (as in the case of constraints on lenition), or they are largely descriptive, rather than explanatory (as in the case of (ir)reducability of functional items). The problem clearly stems from the underlying commitments of these theories to a version of isomorphy which is not necessarily productive.

To complete this discussion, the next section discusses the contributions of what is in many ways the culmination of the isomorphic view, as presented in Selkirk's (2011) framework of "Match Theory". Importantly, Match Theory does assume a direct and isomorphic relation between syntax and prosody at an underlying level, but also emphasizes the role of non-syntactic factors influencing prosodic structure. This brief discussion of Match Theory will provide a transition-point between the isomorphic view of syntax-prosody and a strictly non-isomorphic stress-based view articulated by Lahiri & Plank (2010).

2.3.3 Match Theory (Selkirk 2011)

Building on the framework of Optimality Theory, Selkirk (2011:439) develops the following set of constraints for the mapping between syntactic and prosodic form:

(37) a. **MATCH CLAUSE:** A clause in syntactic constituent structure must be matched by a corresponding prosodic constituent, call it ι, in phonological representation.

b. **MATCH PHRASE:** A phrase in syntactic constituent structure must be matched by a corresponding prosodic constituent, call it φ, in phonological representation.

c. **MATCH WORD:** A word in syntactic constituent structure must be matched by a corresponding prosodic constituent, call it ω, in phonological representation.

As can be seen, the underlying assumption is that syntactic and prosodic form should, in the simplest case, match up, and the constraints above have the effect of driving a preference for isomorphy. This is, in essence, the culmination of the isomorphic viewpoint, identifying specific syntactic primitives (clause, phrase, head) with specific prosodic primitives (ι, φ, ω) from the Prosodic Hierarchy. It should be emphasized that Match Theory does not by any means preclude the existence of non-isomorphic syntax-prosody relations. Selkirk is clear that the relation between these two systems is governed by a variety of factors, both syntactic and non-syntactic, and many non-syntactic factors have been identified in subsequent works which incorporate Match Theory (e.g., Elfner 2012, Richards 2014). Crucial for the discussion here, however, is the fact that, at the deepest level, Match Theory assumes a one-to-one correspondence between syntactic and prosodic primitives, and this has consequences for the nature of the accounts it supports, as well as its explanatory power.

As in the preceding discussion, the aspect of Match Theory that is of significant interest here is its treatment of the lexical/functional divide and whether or not it makes different predictions from the alignment- and parsing-based frameworks reviewed in the foregoing sections. Selkirk addresses the prosodification of functional items briefly (2011:453-455) in a discussion of the application of MATCH PHRASE, which is responsible for assigning φ-status to XPs. Interestingly, Selkirk does not mention proclisis of function words in English here, but instead focuses on crosslinguistic cases where functional items are regularly prosodified as enclitics (leftward dependent), in violation of syntactic constituency (e.g., enclitic prepositions in Chinese, determiners in Kwakwala and Chamicuro, noun-class morphemes in Xitsonga, etc.). In order to allow for this potential mismatch between syntactic and prosodic structure, Selkirk harkens back to the "Principle of Categorial Invisibility of Function Words" (Selkirk 1984:226) or Truckenbrodt's "Lexical Category Principle" (1999:226) by proposing that XPs projected from functional items may be ignored by MATCH PHRASE, leaving function words unphrased and potentially subject to independent rules of enclisis and proclisis.

This is a notable development, since it leaves a Match Theoretic account of facts like word-initial lenition and phrase-final vowel reduction in English unclear, simply stipulating that functional items fall outside the purview of constraints which otherwise govern syntax-prosody isomorphy. Furthermore, if XPs projected from functional items are indeed not targeted by mapping constraints like MATCH PHRASE, this has consequences for the ability of such a constraint to account for the prosodification of lexical and functional items in an explanatory way. If only lexical projections are targeted by MATCH PHRASE, then, in essence, only lexical words will form independent φ. Selkirk

then leaves open the possibility that functional items can be incorporated leftward or rightward according to non-syntactic factors. The problem is that, in many cases, the only way for prosody to directly reflect syntax is in the prosodification of function words. Giving up MATCH PHRASE for function words is, in essence, giving up the assumption of isomorphy in general, at least at the intermediate level of φ-phrasing.

With this said, I now turn to an alternative theory which is able to pick up precisely where Match Theory leaves off in terms of the prosodification of lexical vs. functional items. This perspective has not gained nearly the level of currency as the strict isomorphic view, but has nevertheless existed in parallel with it. It is represented in work by Lahiri & Plank (2010) and it argues for a non-isomorphic view of the syntax-prosody relation, with specific attention, as will be seen, to the level of φ-phrasing, which is ultimately characterized by a stress-based algorithm. It will be shown that opening up the scope of mismatches between syntactic and prosodic constituents allows us to develop a theory that captures the data and is explanatory. However, it will also be demonstrated that the non-isomorphic view cannot dispense with syntactic information entirely.

2.4 Conclusion

The goal of this chapter is to provide an understanding of the basic data that bears on the relation between the system of syntax and the system of phonology/prosody in English, especially as it manifests in the distinction between lexical and functional words. To that end, I have reviewed various theoretical principles and previous accounts which seek to capture aspects of the syntax/prosody relation, noting that the common thread tying them together is a basic assumption of isomorphy between syntax and prosody at an underlying level. Furthermore, by comparing different isomorphic accounts, it becomes clear that a

purely isomorphic approach to the syntax/prosody relation is unable to account for phonological facts manifesting in irreducibility of function words and word-initial lenition/flapping in an explanatory manner. This sets the stage for the next chapter, which presents an alternative non-isomorphic account, but also argues that aspects of the isomorphic approach are necessary alongside the non-isomorphic approach.

CHAPTER 3

A NON-ISOMORPHIC VIEW OF PROSODIC PHRASING

In this chapter, I introduce a perspective on the construction of a prosodic representation that assumes no obligatorily direct mapping between the syntactic representation of a sentence and the prosodic representation of that sentence. Instead, the construction of prosodic domains in English and related languages is largely characterized by grouping based on stress prominence. I begin by reviewing a wealth of evidence from diachronic, synchronic, and experimental sources to establish that the default pattern for prosodification of functional items in English and Germanic languages is enclisis (i.e. leftwards dependence). This goes against the general assumption of many isomorphic accounts where proclisis (rightwards dependence) is considered to be the norm in English, reflecting the head-initial pattern of English syntax. I introduce an alternative stress-based approach to prosodic phrasing at the level of the phonological phrase (φ) and apply it to capture the distribution of phonological process of word-initial lenition and segment-deletion. After this, I reassess data from vowel reduction of functional items and intrusive-[r] dialects (originally presented in Chapter 2), concluding that an isomorphic mapping between syntax and prosody is still necessary in order to account for aspects of prosodic word formation, developing an account of syntax-prosody mapping within a Minimalist framework assuming Merge, Label, and a root vs. category distinction in syntactic formatives.

3.1 Introduction

Some of the earliest modern works on English grammar—many of which focused on teaching grammar to students of English—are fascinating in the way that they

characterize the relation between syntax and prosody. In particular, consider the conventions for phonetic transcription developed by Henry Sweet (1887) in his grammar book for German learners of English. Sweet explicitly classifies functional items (determiners, auxiliaries, pronouns, coordinators, etc.) as suffixal, attaching to the lexical items which precede them. Furthermore, suffixal vs. free-morpheme status is dependent on the presence/absence of stress (*starkbetont*) in the sentence. In (1), the determiner *a*, the pronoun *he* and the verb *is* are all considered suffixal, attaching to the stressed words that precede them.[8] In (2), the pronoun *he* is suffixal, but the verb *is* is not due to the presence of stress (see footnote 8). In (3), the complementizer *whether* is suffixal in the presence of the strongly stressed preceding verb *know* (indicated by capital letters in (3)), along with the pronoun+auxiliary complex *he'll* and the coordinator *or*. Notably, Sweet also treats functional items which precede a main stress as suffixal, attaching to the sentence that precedes them (*-ai* "I" in (3)).

(1) *:whot -ə fuwl -ij -iz\!*

what a fool he is

"What a fool he is!"

(2) *:huw iz -ij\?*

who is he

"Who is he?"

[8] The presence of stress is generally indicated by the absence of a dash indicating suffixhood and special phrasal-stress is indicated by <:> preceding the stressed word. The symbol <\> at the end of the sentence indicates a falling tone, characteristic of declaratives, imperatives, and *wh*-interrogatives.

(3) *-ai dount :nou -wheðər -ijl duw -it -ö not.*

I don't know whether he'll do it or not

"I don't KNOW whether he'll DO it or NOT."

These judgements by Sweet are consistent in his other works (1876, 1877, 1885/1904) and the works of other phoneticians of his time, such as Steele (1775/1179), and Sievers (1901a-b), and similar concepts are incorporated into the works of other grammarians like Saran (1907, 1934), Paul (1916-1920) and Luick (1923), as well as in teaching materials and theoretical proposals made by a range of linguists in the latter 1900s (see Lahiri & Plank 2010 for an overview). Crucially, they demonstrate a thread of assumptions about the nature of prosodification and its relation to syntactic categories and phrasing. In particular, these judgements show a widespread violation of syntactic boundaries by prosodic organization targeting the lexical/functional divide, governed and determined by principles of stress, prominence, and rhythm. As a consequence, it appears to be a widespread pattern in Germanic languages for functional words to be perceived as *enclitic* rather than proclitic.

Lahiri & Plank (2010) present a range of additional data from diachronic, synchronic, and experimental sources to support this interpretation. Their position can be summarized in the following quote:

> "On this view, phonological phrasing […] is seen as *independent* of morphosyntactic constituency – except insofar as it respects (i) clause boundaries (reflecting major planning units); (ii) the distinction between lexical and grammatical morphemes […]; (iii) perhaps inherent weight (quantity,

branchingness); and (iv) focus (which also adds prominence, and perhaps attenuates prominence in parts following the focus)." (2010:374)

By this, we can see that the general motivating principle of phonological domain formation does not directly reference syntactic information at all, with the possible exception of (i) (see below). Instead, domains are formed on the basis of stress-prominence (including category-type which Lahiri & Plank correlate with word-stress). This will have specific consequences for the formalization of domain-formation. For now, I will review the range of data that Lahiri & Plank (henceforth L&P) bring to bear on the issue of the prosodic directionality of functional words in Germanic languages.

3.2 Evidence for the Non-Isomorphic View

3.2.1 Diachronic Evidence

L&P begin by noting two diachronic facts about Germanic languages in general. First, Germanic inflection is overwhelming suffixal, rather than prefixal. Second, functional items which undergo morphophonological reduction over time tend to survive as suffixes, but are commonly lost when they become prefixal. This process is observed time and again in the history of Germanic languages and other language families.

Perhaps the earliest example of the process from independent word to suffix is found in the formation of the Germanic weak preterite, which takes the form of *-d/-t* in modern times, depending on the language. A long-standing theory is that this suffix originates from a periphrastic construction with a full lexical verb plus a form of the light verb *dōn* (specifically its imperfect form *ded-*) in Proto-Germanic.

(4) PGmc. **lūbō* + *ded-/dōn* > OE *lufe-**de*** > PDE *love-**d***

This idea starts as early as Bopp (1816); see Kiparsky (2009) for an overview. Lahiri (2000) proposes that the development of this light verb into a suffix proceeds by an intermediate step whereby the independent word-form is reanalyzed as an enclitic, and this explains certain puzzling aspects of the verb's phonological development. Crucially, however, it provides a common pattern whereby a formerly independent functional item (in this case a light verb or auxiliary) is prosodically integrated into a preceding phonological domain. This same pattern manifests throughout the history of Germanic languages:

(5) **North Germanic**:

a. ON *sik* (reflexive pronoun) becomes a verbal enclitic *=(s/z)k*, eventually reanalyzed as a middle/passive marker, Nor./Dan./Sw. *-s* or Icel./Far. *-st*: ON *kallið **sik*** "call yourself" > *kalli=**sk*** > Icel. *kalli-**st,*** Sw. *kalla-**s***.

b. A 2sg imperative suffix *-ðu/-du/-tu* in Icelandic originates from a following 2sg nominative pronoun *þú.*

c. The definiteness marker in NGmc. dialects (viz. Sw. *-en/-na*) putatively derives from an older demonstrative *(h)inn* by analogy with periphrastic constructions: *björn hinn stori* "bear the large" > *björn-inn (stori)* "bear-the (large)" > *björn-en* "the bear".

(6) **West Germanic:**

a. The PGmc. 2sg present indicative suffix **-es/-is* becomes reinforced by accretion of additional *t* (> OE, OHG *-est*) from constructions with the 2sg nominative pronoun *þū*: lPGMc. **lūbes **þū*** > **lūbes**tū*** > OE *lūfes**t*** (*þū*)

b. Dual pronouns in many dialects are formed from a pronoun + PGmc. **dwo* "two": **wīz=**dwo**, *jūz=**dwo**,* > OE, OLG *wi**t**, gi**t*** (see also ON *vi**t**, i**t***; and Goth. *wi**t**, ju**t***).

L&P also emphasize the general absence of functional items which are prefixal or proclitic and which remain stable diachronically. The two primary examples of functional prefixes/proclitics in Germanic languages—the negative particle *ne/ni* and the verbal prefix *ga-/ge-/gi-*—are both notable for the fact that they are phonologically quite weak, both being lost in later stages. Note further that, in the case of (7a) below, the item which renews the lost negative particle consists of a combination of another negative particle *na* "no" and the word *wiht* "thing". In this case, *wiht* (i.e. the second component of the construction) is the item that undergoes reduction, while the primary element *na* does not, again following the trend for enclisis.

(7) **Prefixes**

a. Germanic negative particle *ne/ni* acts as prefixal/proclitic *n=* upon a word with no onset or with /h, w/ as onset: OE *n=is* (*ne+is* "is not"), *n=æfre* (*ne+æfre* "never"), *n=abban* (*ne+habban* "not have"). Eventually lost, renewed by OE *na+wiht* > *naht, noht* > PDE *not.*

b. Germanic verbal prefix *ga-/ge-/gi-* > OE *ge-*, *y-* > ME *y- i-* > Ø.

Taken altogether, these diachronic facts provide strong evidence for the prevalence and stability of enclisis as the primary pattern for prosodification of functional morphemes in Germanic languages. This evidence stands as a testament to the importance of incorporating a diachronic perspective into our theories of syntax/prosody.

With this in mind, we now turn to some further evidence for enclisis from present-day English.

3.2.2 Synchronic Evidence

Examples of enclisis can also be identified synchronically in present-day English, a significant number of which have largely been assigned an "exceptional" status in isomorphic syntax/prosody accounts. We begin with probably the most widely-discussed example: contractions of verbal auxiliaries. The finite forms of the modal auxiliaries *will* and *would* (=8), the finite and non-finite forms of perfect auxiliary *have* (=9), and finite present tense forms of the verb *be* (*am, is, are*) (=10) may all encliticize directly to what precedes them, showing a phonologically reduced form consisting of at least the final coda-consonant in the stem. In addition, the marker of sentential negation *not* may reduce to *-n't* and encliticize (=11).

(8) a. Susan **will** visit. / Susan**'ll** visit. -*'ll* = [(ə)l][9]

b. Susan **would** visit. / Susan**'d** visit. -*'d* = [(ə)d]

(9) a. Susan **has** visited. / Susan**'s** [z] visited. -*'s* = [(ə)z]

b. They **have** visited. / They**'ve** visited. -*'ve* = [(ə)v]

c. They would **have** visited / They would**'ve/-a** visited. -*'ve* = [ə(v)]

(10) a. Susan **is** happy. / Susan**'s** happy. -*'s* = [z]

b. I **am** happy. / I**'m** happy. -*'m* = [m]

c. They **are** happy. / They**'re** happy. -*'re* = [(ə)r]

(11) Susan did **not** visit. / Susan did**n't** visit. *-n't* = [(ə)n(t)]

[9] In cases where the reduced item ends in a liquid or nasal, the contraction may be realized as a syllabic consonant instead.

Another significant example of encliticization involves the infinitive marker *to*, which frequently groups together with a preceding verb or auxiliary as *-(t)a* [(t)ə] to form new items that are prone to grammaticalization (=12):

(12) a. Susan ought **to** visit. / Susan ough**ta** visit.

b. Susan was going **to** visit. / Susan was gon**na** visit.

c. Susan was trying **to** visit. / Susan was try**na** visit.

d. Susan will want **to** visit. / Susan will wan**na** visit.

e. Susan will have **to** visit. / Susan will haf**ta** visit.

Additional examples following the same pattern include the preposition *of*, which reduces to *-a* [ə] and is incorporated into the syllable-structure of a preceding word (=13), the coordinator *and*, which reduces to *'n* [(ə)n] (=14a), and the possessive-marker *-'s* which syntactically heads the phrase to its right but phonologically attaches to the phrase on its left (=14b):

(13) a. Susan bought one cup **of** coffee / one cupp**a** coffee.

b. Susan didn't think **of** that / think**a** that.

(14) a. I met Susan **and** Jane / Susan **'n** Jane.

b. I met Susan**'s** cat.

Finally, object pronouns provide a clear example of enclitic organization. Forms like *her, him, them,* and *you* may all be reduced when in postverbal position or after a preposition (=15) (see section 3.2.2 below for more detailed discussion of this process, termed "word-initial segment-deletion").

(15) a. Susan met **her**. / Susan met **'er**. *'er* = [ər]

b. Susan met **him**. / Susan met **'m**. *'m* = [əm]

c. Susan met **them**. / Susan met **‘em**. *‘em* = [əm]

d. Susan met **you**. / Susan met **ya.** *ya* = [jə]

These types of processes are reflected beyond English as well. See L&P 2010 for discussion of encliticization as the origin of complementizer agreement morphology in German, Dutch, and Flemish dialects, of inflecting prepositions in German (also I&M 2009 for further data), and of various other constructions where prosodic organization appears to disregard syntactic bracketing. Although this evidence is certainly compelling, it should be accompanied by additional evidence from other areas like language processing and production. To this end, L&P discuss some of the experimental results that have been used to justify the isomorphic view, and they also point to experimental research which supports the non-isomorphic view, which we will review briefly below.

3.2.3 Experimental Evidence

A variety of experiments have been performed over the years to assess the nature of the syntax-prosody relation, and many have concluded that there is a basis for a purely syntactic determination for phonological phrasing. Patel (2008) provides an overview of experimental work—including research by Price et al. (1991), Wightman et al. (1992), De Pijper & Sanderman (1994), and Watson & Gibson (2004), among others—which note some strong correlations between phonological phrasing and, for example, depth of syntactic bracketing. Wagner (2005, 2010) comes to similar conclusions in this respect in relation to stronger breaks between words correlating with stronger/deeper syntactic breaks. Furthermore, a long line of research initiated by Fougeron & Keating (1997) has found strong correlations between processes of strengthening in domain-initial positions usually stated in terms of higher-level prosodic categories (see also Cho & Keating 2001

for Korean; Flack 2006). Under the isomorphic view, the boundaries of higher-level prosodic categories like intonation phrase and utterance automatically correlate with a higher number of syntactic brackets, and so it is tempting to conclude that the two are closely related.

It should be noted, however, that despite the conclusions of research made above, most accounts also find numerous examples of mismatches between syntactic and prosodic units, many of which are directly attributable to factors in speech production. See for example Gee & Grosjean (1983), Ferreira (1991), Shattuck-Hufnagel & Turk (1996), and Wenk & Wiolland (1982) where various additional factors influenced prosodic phrasing, including constraints on the quantity of groupings (phrases shouldn't be too long or too short) and preferences for balancing the size of groups, regardless of the syntactic bracketing involved. Even going back to Chomsky & Halle (1968), it was noted (and has been noted regularly since, see Nespor & Vogel (1986), Ladd (1996)) that the intonational prosody of sentences with multiple recursive embedding of clauses must be non-isomorphic to some extent:

(16) a. This is the cat that chased the rat that ate the cheese that lived in the house that Jack built.

b. (This is the cat) (that chased the rat) (that ate the cheese) (that lived in the house that Jack built)

Furthermore, in the literature on language processing, Cutler & Norris (1988) advocate for an algorithm (the "Metrical Segmentation Strategy") for English that segments prosodic domains by syllable prominence (stress, unreduced nucleus) based on evidence that English listeners segment speech at junctures created by strong syllables

regardless of the syntactic constituency. Cutler (1997) and Cutler et al. (1986, 1992) also show that English speakers follow the same segmentation strategy even when listening to other languages. This results in segmentation where strong prosodic boundaries are apparently inserted inside words and cross-cutting syntactic phrases.

Building on these observations, Wheeldon & Lahiri (1997) performed an important experiment to test variations in planning-time associated with language production for various types of sentences in Dutch. In the experiment, subjects were presented with a specific phrase (e.g., "fresh water") followed by a question (e.g., "What do you drink?), and were required to respond to the question with a sentence incorporating the previously-presented phrase (e.g. "I drink fresh water"). Two paradigms were designed based on how quickly the subject was required to answer the question: a "delayed paradigm" and an "immediate paradigm". In the delayed paradigm, speakers were presented with the phrase and question and were then given time to plan their answer. In the immediate paradigm, speakers were required to respond to the question immediately without planning, under the assumption that this would change the nature of the language processing involved. The specific sentences that subjects constructed for their answers took the forms in (17) depending on the phrase provided to them.

(17)	**Sentence**	**Enclitic Prediction**	**Proclitic Prediction**
	a. *ik drink het water* "I drink the water"	(ik drink het) (water)	(ik drink) (het water)
	b. *ik drink water* "I drink water"	(ik drink) (water)	(ik drink) (water)

c. *ik drink vers water* (ik drink) (vers) (water) (ik drink) (vers) (water)

"I drink fresh water"

As shown, the composition of the phrase (single lexical noun, determiner + noun, or lexical adjective + lexical noun) could potentially change the phonological representation of the sentence depending on whether or not determiners (and functional items more generally) are enclitic or proclitic. In particular, note the different predictions made in (17a), where *het* "the" is predicted to be organized leftward by an enclitic approach, rightward by a proclitic approach. Thus, different views on the prosodic organization of functional items make different predictions as to the number and composition of prosodic domains (prosodic words, phonological phrases, etc.) involved in each sentence. Wheeldon & Lahiri then measured the time that it took for speakers to respond to the question posed to them for each sentence in each paradigm and compared the outcomes.

The results of the experiment were illuminating. In the delayed paradigm, which allowed speakers time to prepare their answer fully before responding, the sentence in (17c) (adjective + noun) took the longest for speakers to formulate, while (17a-b) (determiner + noun and bare noun, respectively) were equal. This fits with the predictions made for both enclitic and proclitic approaches since, in each case, the size of the entire sentence in terms of the number of prosodic domains (two or three depending on the sentence) was equal, and this overall size measurement was what mattered for delayed production time.

In the immediate paradigm, on the other hand, there were different results. The production of the sentence in (17a) took the longest, while (17b-c) were equal. The assumption was that the immediate paradigm would test the relevance of the size of the

initial unit that had to be produced, rather than the size of the entire sentence, since speakers had very little time to plan. If the determiner *het* was indeed enclitic, it would form a part of that initial unit, causing a lag in production time since the unit would then consist of three individuals words (*ik*, *drink*, and *het*), while if the determiner was proclitic, it would not affect immediate production time at all, since the initial unit would be the same size for all three sentence (two words: *ik* and *drink*). In this case, the results of the experiment align fully with the enclitic approach: speakers took the longest to produce (17a) because the determiner formed a part of the initial unit, which therefore contained three separate words and required extra time to prepare. The remaining two sentences showed no difference because their initial units were the same size. This result is a notable confirmation of the enclitic status of determiners in Dutch, which, in combination with the diachronic and synchronic facts reviewed above, can be uncontroversially extended to English and other Germanic languages.

3.2.4 Intermediate Summary

The larger picture that arises from the examination of diachronic, synchronic, and experimental evidence is one where functional categories in English maintain a special syntactic status with respect to lexical categories, but where the directionality of their prosodic dependency (leftward, enclitic) does not reflect the directionality of their syntactic dependency (rightward, head-initial). This empirical picture is significantly different from the picture presented in isomorphic alignment accounts of the prosodification of the functional items. In such accounts, data on, e.g., auxiliary contraction and reduced object pronoun forms is often set aside as an exception to the

default rule of procliticization (viz. the often-cited accounts by Selkirk (1986, 1995), as noted above).

In examining the full range of data, however, it is clear that the majority of functional categories in English, including common verbal auxiliaries, many monosyllabic prepositions, pronouns, and coordinators—even some determiners[10]—have enclitic properties; more than can be reasonably attributed to special exceptions and peripheral mechanisms. Once these facts are accepted, the means of accounting for them in a theoretically parsimonious way becomes significantly different from proposals that assume default proclisis. To that end, we will now examine the partial formalization of the non-isomorphic system presented by L&P (2010) and apply it to the range of data discussed so far, demonstrating how a stress-based conception of phonological phrasing offers a simpler and more explanatory account of the foregoing facts.

3.3 A Non-Isomorphic Account of Phonological Phrasing

L&P adopt the view that the formation of prosodic structure is primarily influenced by principles of rhythm and meter. As a consequence, they assume that in English and other Germanic languages, the primary phonological domains or segmentations are formed based on word- and phrasal-stress. In fact, the conventions developed by Sweet (1887) (introduced at the start of section 3.1) provide a close approximation of the kind of prosodic organization imagined by L&P. If we adopt the standard bracketing notation for prosodic phrasing, indicating the relations of stressed words by adding the acute accent to stressed syllables, and eliminate the suffix-marking of unstressed syllables, we arrive at the phonological representation in the (b)-sentences derived from the (a)-sentences.

[10] See Roeder (2012) for an analysis of encliticization of the definite article *the* > *-th* in the English dialect of York.

(18) a. *:whot -ə fuwl -ij -iz\!*

b. (whát a) (fóol he is)

(19) a. *:huw iz -ij\?*

b. (whó) (ís he)?

(20) a. *-ai dount :nou -wheðər -ijl duw -it -ö not.*

b. I (dón't) (knów whether he'll) (dó it or) (nót)

This notation for prosodic phrasing accords with the findings of Cutler & Norris (1988), Cutler (1997), and Cutler et al. (1986, 1992) on metrical segmentation in English, and, interestingly, the principles of phrasing closely track common traditions of foot-assignment in poetic scansion. In English, trochaic footing—a stressed syllable followed by an unstressed syllable ($_{f}$ 'σ σ)—is common, and the phrasing in (18)-(20) closely follows the trochaic pattern, whereby domains are initiated by a strongly stressed syllable, and all unstressed or weakly stressed syllables following the major stress are incorporated into the preceding domain (i.e. as enclitics). When another strong stress is encountered, the previous domain is closed and a new domain is initiated. These domains (notated with parentheses above) are at least at the level of the phonological phrase φ, and they will be referred to as such in the rest of the discussion. In addition, note the treatment of the pronoun *I* at the beginning of (20): an unstressed syllable is left stranded at the beginning of a sentence without a preceding domain to be incorporated into via enclisis. In this case, L&P assume the application of "anacrusis", whereby the initial syllable remains unphrased with the φ which follows it. This does not mean that sentence-initial unstressed words will remain completely unphrased, since they are still incorporated into higher-level prosodic categories like ι and υ (see (21') below).

Finally, although L&P characterize their own approach as non-isomorphic, positioning their proposals in strong contrast to frameworks assuming a direct relation between syntactic and prosodic boundaries, they do admit to an indirect relation between syntactic units and prosodic units at the level of clauses or sentences, which reflect (in their words) "major planning units" (2010:374). Note, however, that this relation between syntax and prosody does not require the assumption that prosody directly references the opening syntactic bracket of S or CP. It simply reflects the independent fact that a sentence (or whatever unit is being uttered) must start somewhere and end somewhere, and this is an indirect point of matchup between all linguistic domains.

These are the basic principles of the non-isomorphic system advocated for by L&P. To assess whether or not it truly has an advantage over the isomorphic systems that have remained so dominant in linguistic theory, we will now apply the predictions of this system to previously discussed data, starting with the constraints on word-initial lenition/flapping, followed by constraints on the (ir)reducability of functional items.

3.3.1 Application to Lenition/Flapping

Recall the facts from (32)-(33) above summarized in (21), and additional facts in (22) (adapted from Selkirk 1995). Lenition/flapping of word-initial voiceless stops is allowed on functional words (21a) except when a functional word is aligned with an intonational break, such as at the start of a new intonation phrase (21b) or a new utterance (21c). In addition, lenition/flapping is allowed in the onset of unstressed syllables (22a) and disallowed in the onset of stressed syllables (22b), as well as when a syllable is word-initial within a lexical word, regardless of stress (22c).

(21) a. Susan drove [ɾ]o Tucson

b. I will drive, Susan said, [t^h]o Tucson

c. Where did Susan drive? – [t^h]o Tucson

(22) a. tomá[ɾ]o, antí[p]athy, attá[k]er

b. i[t^h]álic, a[p^h]árently, ly[k^h]ánthropy

c. [t^h]orónto, [t^h]úcson; [p^h]arénthesis, [p^h]árent; [k^h]aléndula, [k^h]álendar

The bigger picture here, as pointed out by I&M (2009), is that lenition appears to be constrained at the left/leading edge of prosodic domains at (nearly) all levels. This is clear for the level of the foot (22a vs. 22b), the prosodic word ω (22c), the intonation phrase ι (21b) and the utterance itself υ (21c). The only context where lenition is truly allowed is (i) internal to a foot (=22a), and (ii) internal to some prosodic domain located between ι/υ and ω (=21a). This is diagramed in (23), with the unknown intermediate prosodic domain listed as "?".

(23) **(**$_{\upsilon}$ *[ɾ] … **(**$_{\iota}$ *[ɾ] …**(**$_{?}$ … ^{OK}[ɾ] **(**$_{\omega}$ *[ɾ] … **(**$_{f}$ … ^{OK}[ɾ])))))

Much debate within alignment-based frameworks has been generated by the need to identify this intermediate phonological domain and explain its special properties, leading to an explosion of intermediate prosodic category: phonological phrase, major phrase, minor phrase, clitic group, accentual phrase, intermediate phrase, etc. The root of the problem, however, is in the presupposition of syntax/prosody: because there is a syntactic bracket preceding the functional item, i.e. *to* in (21a), an isomorphic view is forced to insert a corresponding prosodic bracket in the initial state of the prosodic mapping: [to …] → (to …). The facts indicate that lenition is disallowed at the leading edge of all clearly identifiable phonological domains. In (21a), however, lenition is allowed. Under

the simplest assumptions, this should indicate that the functional item *to* is not aligned to the leading edge of any domain in (21a), regardless of the syntactic bracketing. Instead, it is incorporated into a domain on its left as an enclitic: [drove [to Tucson]] → (dróve to) (Túcson). This is exactly the prediction made by the non-isomorphic approach, which does not need to reify syntactic bracketing in prosodic bracketing.

To illustrate, the sentences and words in (21)-(22) are repeated below as (21')-(22') with the non-isomorphic bracketing assigned. As noted above, the larger phonological domains that are constructed on the basis of stress are identified here as phonological phrases φ, a label which has widespread currency in literature on prosody as a neutral term for a prosodic level standing between the topmost prosodic categories like υ/ι and bottommost categories like ω, foot, etc. The φ-level can be distinguished from ω on the basis of examples listed in (22'c), which shows that the leading edge of ω disallows lenition even in the absence of stress (compare *Torónto* and *Túcson*).

(21') a. (υ (ι (φ Súsan) (φ dróve [ɾ]o) (φ Túcson)))

b. (υ (ι (φ I will dríve)), (ι (φ Súsan) (φ sáid)), (ι [t^h]o (φ Túcson)))

c. (υ (ι (φ Whére did) (φ Súsan) (φ dríve)))? – (υ [t^h]o (φ Túcson))

(22') a. (ω to(f má[ɾ]o))

(ω an(f tí[p]a)thy)

(ω at(f tá[k]er))

b. (ω i(f [t^h]álic))

(ω a(f [p^h]áren)tly)

(ω ly(f [k^h]ánthro)py)

c. (ω [t^{h}]o(f rónto)), (ω (f [t^{h}]úcson))

(ω [p^{h}]a (f rénthe)sis), (ω (f [p^{h}]árent))

(ω [k^{h}]a(f léndu)la), (ω (f [k^{h}]álen)dar)

It is also useful to adopt some of the basic principles of the SLH which govern the organization of hierarchical prosodic domains. These are important to capture additional contexts in which lenition on functional items is prohibited, as discussed by Selkirk (1996), including focus contexts (=24) and functional words uttered in isolation (=25). In the former case, focus adds additional stress-prominence to a targeted word, and because of the stress-based algorithm for domain-creation, this results in the focused word establishing its own φ. Thus, a focused functional word is aligned to the leading edge of a φ and may not undergo lenition. In the case of isolated words, the word itself constitutes an utterance on its own, and therefore a functional word uttered in isolation will align to the leading edge of υ and may not undergo lenition.

(24) Susan drove **TO** Tucson, not FROM it!

= (φ Súsan) (φ dróve) **(φ [t^{h}]ó$_{=\text{FOCUS}}$)** (φ Túcson) …

(25) … **to**, for, from, away, etc.

= (υ **[t^{h}]o**) (υ for) (υ from) (υ away) …

A final piece of data to round out our understanding of lenition/flapping comes from an isolated set of lexical words whose initial syllable *to-* is subject to lenition, contrary to expectations. These include the words *today* (=[ɾ]*oday*), *tomorrow* (=[ɾ]*omorrow*), and *tonight* ([ɾ]*onight*). I&M (2009) discuss these puzzling exceptions to the otherwise widespread and consistent constraint against lenition/flapping of word-initial voiceless stops on lexical words. While it is true that both of the initial *to*-syllables are unstressed,

this do not allow lenition/flapping in other cases like *tomato* (=[t^{h}]*omato*) and *Toronto* (=[t^{h}]*oronto*). Word-frequency cannot be appealed to either, since, e.g., *tomato* is itself a high-frequency word that cannot undergo lenition (I&M 2009:160, fn.18).

It is notable that each of these words originates diachronically from a prepositional phrase: *to-day, to-morrow, to-night*. However, I&M do not countenance the possibility that the special prosodic character of these items might be historically conditioned because it would be difficult to reconcile with other constraints on the synchronic system[11]. The problem is only surface-level, however, since, on a closer examination, the presence/absence of lenition/flapping is a matter of syntactic category. The words *today, tomorrow,* and *tonight* typically function as adverbs, and, as modifiers, they allow lenition/flapping (=26). But they may also function as nouns, in which case lenition/flapping is much less acceptable (=27).

(26) Susan will visit [ɾ]oday$_{Adv}$ / [ɾ]onight$_{Adv}$ / [ɾ]omorrow$_{Adv}$

(27) a. Susan watched the "[t^{h}]oday$_{N}$ Show".

b. Susan watched the "[t^{h}]onight$_{N}$ Show".

c. Susan will visit on the morning of [t^{h}]omorrow$_{N}$.

This hints at the correct analysis: the adverbial usage of these words derives from their diachronic origin as PPs. The exceptional properties of these words can therefore be attributed to a lexical specification based on diachrony, possibly preserved by the surface similarity they share with the preposition *to* and full lexical words like *day, night*, and possibly *morrow*.

[11] For instance, mapping the initial syllable of the stem of a lexical item which should be parsed as a single ω to a position outside that ω, *tomorrow*$_{Lex}$ > (ʔ *to* (ω *morrow*)), would violate standard conditions of proper bracketing/crossing branches.

At this point, it is clear that a non-isomorphic stress-based system, as proposed by L&P, accounts for patterns of lenition/flapping in a more parsimonious and explanatory way than approaches which use alignment constraints or appeal to recursive prosodic structure. The next section demonstrates that patterns of weakening in intermediate position and strengthening in domain-initial position are not confined to word-initial voiceless stops, but are in fact supported by additional evidence from English in the form of patterns of word-initial [h]-deletion (also "glide-deletion"), facts which have been identified previously but not explicitly connected to constraints on word-initial stop-lenition.

3.3.2 Further Evidence from Word-Initial Segment-Deletion

Zwicky (1970) makes the following observations about English dialects: There is a process of segment-deletion which applies word-initially to many functional items in low stress contexts, targeting "morpheme-initial [h] quite generally, [w] only in *will, would, was,* and *were*, and [ð] in *they, them, than, this, these, that, those,* and *there*" (326). Examples of this process are presented in (28):

(28) a. Susan **has** visited. / Susan **'as** visited. *'as* = [æz]

b. Susan **will** visit. / Susan**'ll** visit. *'ll* = [ɪl]

c. Susan **would** visit / Susan**'d** visit. *'d* = [ʊd]

d. Susan knows **he's** here. / Susan knows **'e's** here. 'e's = [iz]

e. Susan met **her**. / Susan met **'er**. *'er* = [ər]

f. Susan met **him** / Susan met **'im**. *'im* = [ɪm]

g. Susan met **them**. / Susan met **'em**. 'em = [ɛm]

h. Susan is better **than** me. / Susan is better **‘an** me. ‘an = [ɛn]

i. Susan saw **those** guys. / Susan saw **‘ose** guys. *‘ose* = [oz]

Focusing on the deletion of initial [h] specifically, Zwicky notes that some (typically non-North American) speakers are also prone to dropping [h] in the initial syllable of lexical items like *horrendous, humanity,* and *Hispanic*, as well as in the second syllable of *forehead, philharmonic,* and *doghouse* (cf. *inhuman, disharmony*, where [h] is typically maintained). In each of these cases, [h] is dropped when it occupies the onset of an unstressed syllable and it is preserved in the onset of a stressed syllable. Additional examples show that it is actually the *relative* stress of the syllable containing [h] that matters for deletion, such that /h/-deletion is allowed in cases when the morpheme containing [h] follows another word with strong focal stress, even when the word is lexical (=29) and is generally prevented when the morpheme containing [h] is aligned with a leading prosodic boundary (=30).

(29) a. I’m glad JOHN **hit** me, not Sue. *hit* = [hɪt] **or [ɪt]**

b. It was JOHN’s **hat**, not Sue’s, that got crushed. *hat* = [hæt] **or [æt]**

(30) a. **He’s** my best student. *he’s* = [hiz], ***[iz]**

b. Kurt, **having** passed the last test, celebrated. *having* = [hæviŋ], ***[æviŋ]**

Zwicky (1970:fn.4) also notes that other dialects show more widespread application of glide-deletion, but that even in these dialects, word-initial segment-deletion is prohibited in strongly stressed environments and following a major prosodic boundary (see, for example, Sivertsen 1960 for Cockney English).

The match-up between this data and the data on lenition/flapping is clear. In both cases, a weakening process targets the initial segments of mostly functional items, but

this process is arrested in two contexts, (i) the presence of stress-prominence and (ii) the presence of a leading prosodic boundary. With the adoption of the stress-based construction of phonological domains, these contexts collapse together. A stressed syllable will always align either to the leading boundary of a foot ($_{f}$ _ σ) or to the leading boundary of a phonological phrase ($_{\varphi}$ _ …), and an unstressed syllable will always either be internal to a foot ($_{f}$ σ _), internal to a phonological phrase ($_{\varphi}$ … _ …), or forcibly positioned at the leading edge of a prosodic word, intonational phrase, or utterance due to being word- or clause-initial ($_{\upsilon/\iota/\omega}$ _ …). Applying these principles to the data on segment-deletion yields the selected configurations below:

(31) a. ($_{\varphi}$ Súsan **[æz]**) ($_{\varphi}$ vísited)

b. ($_{\varphi}$ Súsan **[ʊd]**) ($_{\varphi}$ vísit)

c. ($_{\varphi}$ Súsan) ($_{\varphi}$ knóws **[iz]**) (hére)

d. ($_{\varphi}$ Súsan) ($_{\varphi}$ mét **[ər]/[ɪm]/[ɛm]**)

e. ($_{\varphi}$ Súsan is) ($_{\varphi}$ bétter **[ɛn]**) ($_{\varphi}$ mé)

(32) a. I'm glad ($_{\varphi}$ JÓHN **[ɪt]** me) …

b. It was ($_{\varphi}$ JÓHN'S **[æt]**) …

c. ($_{\upsilon}$ **[hiz]** my (bést) ($_{\varphi}$ stúdent))

d. ($_{\iota}$ ($_{\varphi}$ Kúrt)) ($_{\iota}$ **[hæviŋ]** ($_{\varphi}$ flúnked the) ($_{\varphi}$ lást) ($_{\varphi}$ tést)), …

These sentences demonstrate that the distribution of processes of weakening (lenition/flapping) and segment-deletion (=31) and the contexts in which these processes are arrested (=32) are best accounted for by a stress-based approach to prosodic phrasing, rather than an approach which requires an underlying isomorphic relation between syntax and prosody to guide phonological phrasing. Within such a system, as shown in the

foregoing discussions, the fact that weakening/deletion targets specific prosodic boundaries (inserted on the basis of underlying syntactic boundaries), but ignores other prosodic boundaries remains unexplained. An approach which allows phonological properties like stress-prominence to directly guide the construction of prosodic domains, on the other hand, provides an immediate explanation for these facts as manifestations of the broader process of domain-initial articulatory strengthening, which has been independently established for a wide range of languages (Fougeron & Keating 1997, Cho & Keating 2001, Flack 2006, etc.).

3.3.3 Failure to Account for (Ir)reducibility & Intrusive-[r]

The final dataset to consider in the context of the stress-based view is constraints on the (ir)reducibility of functional items in phrase-medial versus phrase-final position and correlating constraints on [r]-insertion in intrusive-[r] dialects. To begin, the sentences from (11)-(14) above, have been reconfigured as (33)-(36):

(33) a. Susan went **t[ə]** rounds of golf last week.

b. I attended a round that Susan went **t[u]**.

(34) a. Susan worked **f[ə]r** eight-hour shifts.

b. I was hired by the company that Susan worked **[for]**.

(35) a. Kurt and Susan **c[ə]n** jam all day.

b. Kurt might, but I know Susan **c[æ]n**.

(36) a. Susan**[z]** happy.

b. Kurt might be happy, but I know Susan **[ɪz].**

The (a)-sentences show that functional items may undergo vowel reduction/deletion when they appears sentence/phrase-internally before a lexical item. The (b)-sentences

show that the same functional items may not be reduced when they occupy a phrase-final position. In parallel with this pattern, (37)-(75) reiterate the sentences from (15)-(17), showing how intrusive-[r] dialects allow the insertion of [r] as a hiatus-breaker between low and reduced vowels at the juncture between words (=37), but not when the first word is a functional item (=38). The only exception to this is, once again, when a functional item is in phrase-final position (=39).

(37) a. raw**[r]** apples

b. law**[r]** and order

c. Pamela**[r]** Anderson

(38) a. *Take the**[r]** apples.

b. *Give it to**[r]** Andy.

c. *Jane was gonna**[r]** ask them.

(39) a. I said Jane was gonna**[r]**, and she did.

b. I said Jane oughta**[r]**, and she did.

c. I said Jane would hafta**[r]**, and she did.

Recall that the alignment approaches derive these facts as an "elsewhere" case involving the parsing of prosodic words. Functional items are typically organized into a following prosodic unit (i.e. as a proclitic) headed by a lexical item, and in the absence of that following unit (in the absence of a host for the proclitic), they are parsed as full prosodic words in order to satisfy other independent parsing constraints. On the surface, the phrase-finality of irreducible functional items actually stands as a relatively robust piece of evidence for considering functional items to be proclitic in English, since they seem to be dependent on the phonological context to their right. Furthermore, the stress-

based approach to phrasing does not help us much here, since it does not clearly distinguish between phrase-final and phrase-medial functional items. This appears to be an impasse, since we have previously established that a stress-based approach to phonological phrasing succeeds better than an underlyingly isomorphic alignment-based approach.

In order to move forward, it is important to clarify the nature of irreducibility and what it tells us about the underlying prosodic structure. Environments where phonological reduction applies are typically devoid of acoustic prominence, unstressed syllables being the standard case. In the context of the Prosodic Hierarchy, the only instance where a syllable may remain stressless is when it is (i) parsed as the non-head of a foot ($_{f}$ 'σ _) or (ii) when it remains unparsed altogether: σ($_{f}$ …) or ($_{f}$ …)σ. In all other contexts, the syllable receives stress and remains unreduced, barring the application of some other phonetic process, such as acoustic compression in pre- or post-focal position. Therefore, if a syllable can undergo vowel reduction, this is a sign that it either occupies a non-head position within a foot or it falls outside of a domain in which obligatory prosodic parsing occurs.

As discussed in Chapter 2, the standard assumption of alignment-based approaches like Selkirk 1995 (section 2.4.1) and I&M 2009 (section 2.4.2) is that the prosodic word ω is the domain in which vowel reduction is generally restricted. Recall that Selkirk appeals to an ALIGN(φ, R; ω, R) constraint, while I&M appeal to the constraint PARSE-INTO-ω to force the parsing of phrase-final functional items into full ωs. The implication in each case is that ω-status correlates with irreducibility, and that syllables which end up falling outside the ω-domain may be subject to vowel-reduction because they may remain

unparsed.[12] Although I do not ultimately adopt an alignment-based approach, the assumption that phrase-final functional items owe their irreducibility to ω-status is descriptively useful, and so I will adopt it here, as shown in the (b)-sentences for (33')-(36') below.[13]

(33') a. (υ (ω Súsan) (ω wént) **t[ə]** (ω róunds) of (ω gólf) …)

b. (υ ... that (ω Súsan) (ω wént) (ω **t[u]**))

(34') a. (υ (ω Súsan) (ω wórked) **f[ə]r** (ω éight) (ω hóur) (ω shífts))

b. (υ … that (ω Súsan) (ω wórked) (ω **[for]**))

(35') a. (υ … (ω Súsan) **c[ə]n**) (ω jám) (ω áll) (ω dáy))

b. (υ … I (ω knów) (ω Súsan) (ω **c[æ]n**))

(36') a. (υ (ω Súsan) **[z]** (ω háppy))

b. (υ … I (ω knów) (ω Súsan) (ω **[ɪz]**))

[12] Obligatory parsing vs. optional non-parsing of syllables are governed by the Exhaustivity principle of the SLH (discussed in Chapter 2) which both Selkirk and I&M assume to be a violable constraint. I will assume the same here, since it is clear that syllables which are organized internal to the ω-domain are treated differently from syllables that remain external to it (see discussion in Section 2.4.2). The precise extent to which Exhaustivity can be violated is not our concern here—only the observation that vowel reduction is allowed when syllables fall outside ω.

[13] The ω-status of stranded functional items can be further confirmed by examining the licensing of lenition processes, which, as demonstrated at length above, affect word-initial segments of function words when they are domain internal, but not when they are domain-initial. As an example, my judgement is that word-initial /t/ in (33') cannot undergo lenition when it is stranded, as predicted if *to* is parsed as a ω in this context.

However, it is important to note that the application of word-initial reduction is based on relative stress (see (32) above), and may be impacted by a variety of factors (e.g., minimality requirements for the formation of φ, clash-avoidance, etc.). This is illustrated by the judgements in (i) below, where I believe the distance between the two stresses (one on a preceding lexical word, one on the stranded functional item) in terms of syllables influences the availability of lenition. The longer the distance between the initial stressed item and the functional item, the more likely it is for the functional item to resist lenition (i.e. to establish its own prosodic domain) (=ia). The closer together the two are, the more likely the domains are to be collapsed, with a corresponding allowance of lenition (=ib, ic).

(i) a. the pharmacy they sent (φ Pámela) (φ tó) → *the pharmacy they sent (φ Pámela [ɾ]o)
b. the pharmacy they sent (φ Páula) (φ tó) → ?the pharmacy they sent (φ Páula [ɾ]o)
c. the pharmacy they sent (φ Sháw) (φ tó) → the pharmacy they sent (φ Sháw [ɾ]o)

The origin of ω-status for these stranded functional items will be dealt with in section 2.5. For now, it suffices to distinguish phrase-final functional items as having a distinct prosodic status from phrase-internal functional items. The next step is to provide an explanation for why this should be the case. Ultimately, it will be shown that although a non-isomorphic, stress-based account of φ-phrasing is successful in accounting for reduction-processes like word-initial lenition/flapping and segment-deletion, it is unsuccessful in accounting for the facts of vowel reduction and the assignment of ω-status. Section 2.5 then presents a version of ω-assignment which takes specific properties of syntactic structure into account. Before arriving at this conclusion, however, it is important to explore why previous alignment-based proposals are off track and how a purely non-isomorphic system might attempt to explain phrase-final irreducibility.

The former task is straightforward: Without a motivating assumption of default proclisis in English, the constraints for alignment and parsing proposed by Selkirk (1996) and I&M (2009), which stand as major attempts to explain phrase-final irreducibility in syntax/prosody literature (see Chapter 2, sections 2.4.1 and 2.4.2), are largely descriptive. They both target exceptions to previously-proposed rules of prosodic phrasing ("free (pro)clitic" status of functional items for Selkirk; unexpected prosodic strengthening of functional items for I&M) and formulate additional constraints to cover the exceptions, but the origin of those constraints are not particular illuminating. [14] In other words, it is unclear *why* English has Selkirk's ALIGN(φ, R; ω, R) constraint instead of something else, and while I&M's PARSE-INTO-ω constraint is derived from more general principles of prosodic parsing which have better conceptual motivation, their solution to phrase-

[14] In this respect, they fall into a similar category as Selkirk's (1972) original Monosyllable Rule ((18) in Chapter 2, Section 2.2.1), which simply describes the distribution of destressed functional items.

final parsing of functional items is entirely predicated on the assumption of proclisis in English. If enclisis is allowed as an option—which it clearly is, based on the empirical evidence—then PARSE-INTO-ω is no longer a compelling explanation for irreducibility. Phrase-final functional items should be incorporated as enclitics and should be reducible within I&M's constraint framework.

Setting these constraints aside, let us turn to some alternate explanations that a non-isomorphic approach might appeal to. Based on the existence of a domain-initial strengthening processes which are clearly operative in English and other languages, it might be tempting to claim that there is simply a parallel strengthening process applying at the right boundary of the utterance or intonational phrase which functional items end up aligning with. This is mostly stipulative, however, and is immediately falsified by additional data:

(37) a. I attended a round that Susan went **t[u]** on Friday.

= (υ ... that (ω Súsan) (ω wént) (ω **t[u]**) on (ω Fríday))

(38) a. I was hired by the company that Susan worked **f[o]r** a year ago.

= (υ … that (ω Súsan) (ω wórked) (ω **f[o]r)** a (ω yéar) ago)

(39) a. Kurt might, but I know Susan **c[æ]n** for sure.

= (υ … I (ω knów) (ω Súsan) (ω **c[æ]n)** for (ω súre))

(40) a. Kurt might be happy, but I know Susan **[ɪz]** from her face.

= (υ … I (ω knów) (ω Súsan) (ω **[ɪz]**) from her (ω fáce))

If end-boundary or domain-final strengthening were at work in these sentences, we would expect reduction when the functional item is insulated from a final boundary by additional phonological material, but this is not the case. Instead, irreducibility seems to

be operative at the level of the syntactic phrase in which each functional item is contained (PP, TP/VP, etc.), regardless of where in the surface-string that places the functional item, either sentence-final or sentence-internal. Thus, a domain-final strengthening approach is too course-grained to apply here successfully.

Another option is to take into consideration aspects of pitch-accent assignment. Simplistically, pitch accents are assigned to certain prosodic words in a sentence, giving them additional acoustic prominence beyond the level of word-stress. The general pattern in English is to assign obligatory pitch-accents to the rightmost element of each syntactic phrase. The application of this rule can be seen in sentence (4) from section 2.1 in Chapter 2, repeated with syntactic bracketing below:

(41) $[_{NP}$ ^{H*}Susan] $[_{VP}$ $^{(H*)}$visited $[_{NP}$ ^{H*}Arizona]]

As can be seen, *Susan* and *Arizona* receive obligatory pitch accents because they are rightmost within their respective phrases. We might assume, therefore, that the obligatory parsing of phrase-final functional items as ωs is related to the need for a strong rightmost-aligned prominence in English phrases, forcing stress-prominence on the rightmost element. This is also a non-starter, however, in the light of (37)-(40) above, since in each of these sentences an irreducible functional item is followed by another lexical word which receives an obligatory pitch accent, satisfying (presumably) the requirement for rightmost prominence.

(37') I attended a round that Susan $[_{VP}$ $^{(H*)}$went **t[u]** $[_{PP}$ on $[_{NP}$ $^{\underline{\mathbf{H*}}}$Friday]]]

(38') I was hired by the company that Susan $[_{VP}$ $^{(H*)}$worked **f[o]r** $[_{NP}$ a $^{\underline{\mathbf{H*}}}$year ago]]

(39') Kurt might, but I know [$_{NP}$ Susan]^{H*} [$_{VP}$ **c[æ]n**] [$_{PP}$ for sure]$^{\underline{\mathbf{H*}}}$]]

(40') Kurt might be happy, but I know [$_{NP}$ Susan]^{H*} [$_{VP}$ **[ɪz]** [$_{PP}$ from [$_{NP}$ her face]$^{\underline{\mathbf{H*}}}$]]]

At this point, it is clear that any explanation of the reducibility of functional items must take into account the relation between a functional item and its syntactic context; in particular, the nature of the syntactic context which immediately follows it: a lexical word within the same phrase (=functional item is reducible) or a closing syntactic bracket (=functional item is irreducible). Thus, it is necessary in this case to reference a certain amount of morphosyntactic information in order to feed the initial stages of ω-formation. Let us briefly consider in some more detail exactly what kind of morphosyntactic information is relevant.

Early accounts of the constraints on phrase-final irreducibility appealed to the rule-derived nature of the syntactic configurations in which the constraint applies; namely, the presence of a gap, trace, or empty category following the functional item. Although this has gone unstated so far, it is important to note that all of the foregoing sentences with phrase-final functional items are derived by the application of a rule of syntactic movement (=42a-b) or ellipsis (42c-d) which strands the functional item in place.

(42) a. I attended [$_{NP}$ a round] that Susan went **to** [$_{NP}$ ~~a round~~]

b. I was hired by [$_{NP}$ the company] that Susan worked **for** [$_{NP}$ ~~the company~~]

c. Kurt might [$_{VP}$ succeed], but I know Susan **can** [$_{VP}$ ~~succeed~~]

d. Kurt might be [$_{AdjP}$ happy], but I know Susan **is** [$_{AdjP}$ ~~happy~~]

There are at least two candidates for the type of syntactic information that must be referenced by prosody: (i) the presence of a gap/trace or phonologically null syntactic

terminals or (ii) the closing bracket] of the syntactic phrase. The former option has been argued against strongly in the context of early syntactic trace-theory (Sag & Fodor 1994, Pullum & Zwicky 1996), but the latter has been regularly adopted and forms the basis of the modern treatment of phrase-final functional items in isomorphic frameworks. Selkirk (1972, 1974), for example, posits that reduction is prohibited at the closing boundaries of phonological phrases, which are directly derived from syntactic boundaries, as discussed above.

As theories of syntax/prosody have become more articulated, the phrase-final constraint has been attributed to strictures on the mapping algorithm itself. Thus, as we have seen in detail, Selkirk (1996) and I&M (2009) both conclude, using different sets of Optimality Theory constraints, that reduction of functional items is prohibited in phrase-final contexts due to overarching requirements that phonological material be parsed into prosodic domains. The algorithm is forced to parse stranded functional items into prosodic words—the domain where reduction is assumed to be prohibited—as an "elsewhere" case.

Other proposals which do not otherwise agree with the assumptions of the foregoing accounts must still make reference to syntactic properties of the configurations where functional items cannot be reduced. A notable example is found in work by Pullum & Zwicky (1997) who argue against the notion that the phrase-final restriction may be used as evidence for the existence of traces, but ultimately conclude that the constraint stems from the fact that syntactic constructions impose requirements on the prosody of phonological elements they contain. In this case, the authors claim that the constraint against reduction is due to a requirement that the sole occupant of a syntactic phrase such

as VP must maintain “light stress” at minimum, although they do not provide an explanation for why this must be the case.

In the section that follows, I develop a proposal which takes Pullum & Zwicky’s idea as a starting point and formalizes it within a Minimalist syntactic framework based on proposals by Chomsky (2013, 2015), developing an algorithm (the “Prosodic Word Assignment Rule”) which references basic properties of syntactic phrases (dominance relations between nodes) and maps them to the input for the formation of prosodic words. It is shown that the lexical/functional divide stems from a basic distinction in the primitives that enter into syntactic operations: the distinction between “categories/labels” and lexicosemantic “roots”. I will also propose that the different prosodification of these word-types is a byproduct of the syntactic configurations that arise when these primitives combine together and are subjected to additional operations like the postsyntactic “labeling algorithm” which determines aspects of headedness and linearization (Chomsky 2013, 2015).

3.4 An Isomorphic Account of Prosodic Word Formation

Thus far, I have focused primarily on the specifics of frameworks dealing with prosodic and phonological primitives. Having come to the conclusion that there is a point of contact between prosody and syntax dealing with the formation of lower-level prosodic domains, it is now necessary to be more explicit about the domain of syntax. Recent developments in frameworks of syntax following the research thread of the Minimalist Program (Chomsky 1995) tend to align with a view of syntax-prosody interactions where the point of contact between these two systems is reduced to a

mapping between the most basic primitive relations. The model of syntax adopted here is based on recent proposals by Chomsky (2013, 2015).

In general, syntax is characterized as a linguistic module which maps its output to "interfaces" with other linguistic systems; namely, the interface with sound (the "sensorimotor" system, SM) and meaning (the "conceptual-intensional" system, CI). The Narrow Syntax (NS) itself consists of the operation Merge, a binary combinatory procedure whose domain is recursively defined. That is, Merge may take as input individual primitives supplied by the Lexicon (words, morphemes, etc.), as well as any of its prior outputs. This is illustrated in (43) below, where in (43a) Merge takes the primitives A and B from the Lexicon and combines them into the unit [A B]. In (43b), on the other hand, Merge takes C from the Lexicon as its first input and the previously-constructed unit [A B] as its second input by the recursive definition of its domain, combining them into the larger unit [C [A B]], which will itself be accessible to future iterations of Merge.

(43) a. Merge(A, B) = [A B]

b. Merge(C, [A B]) = [C [A B]]

The objects that Merge creates are eventually transmitted to the CI- and SM-interfaces, and the process of transfer is understood to involve at least one additional operation aside from Merge. This is because, under simplest assumptions, the output of Merge is *symmetrical*. Thus, Merge combines two items together into a single object, but it does not alter, modify, or specify those items any further. This is a potential problem for the CI and SM modules, which rely on specifications of *asymmetry*. For example, the CI-system generally requires identification of asymmetrical predicate and argument

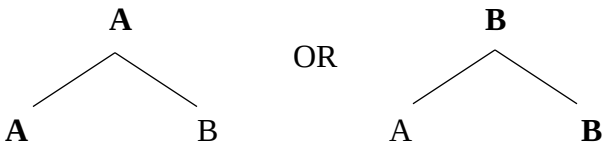
relations for the assignment of theta-roles and semantic scope, while the SM-system must be able to asymmetrically linearize the output of syntax for some spatiotemporal modality, either audio-oral (spoken) or visual-gestural (signed).

Chomsky (2013, 2015) proposes that the additional operation involved in the mapping from NS to the interfaces is to be understood as the determination of a "label" for units created in syntax. This "labeling algorithm" (LA) is a postsyntactic operation which identifies asymmetries in the output of Merge, and these asymmetries are what is exploited for interpretation at both interfaces. The application of Label is shown in (44b), taking the output of Merge in (44a) as input. As can be seen, this operations selects one of the terms of [A B]—either A or B—as the identifying label of the unit. In tree-theoretic terms, Label "projects" the identity of the terminal A or B to an immediately-dominating non-terminal node (=45).

(44) a. Merge(A, B) = [A B]

b. Label([A B]) = [$_{A}$ A B] or [$_{B}$ A B]

(45)



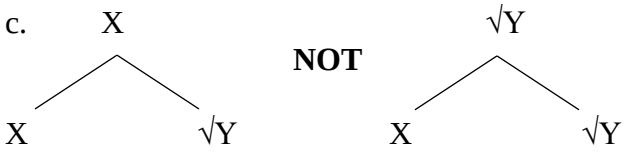
The projecting item is the "head" of the larger phrasal unit, and this information is exploited by the interfaces in order, for example, to linearize the terminals of the tree—placing the head linearly first in head-initial languages, linearly last in head-final languages. The question arises as to how the LA is able to deterministically select A or B for projection. To answer this, Chomsky adopts a network of interrelated proposals targeting the kinds of primitive elements that make up the Lexicon. These ideas have been developed in work on morphology and semantics by, e.g., Alec Marantz (2013),

Hagit Borer (2005), and many others.[15] The upshot of these views (justification of which is beyond the scope of this work) is that the Lexicon, and, hence, part of the domain of Merge, is made up of two types of formatives: lexicosemantic roots (indicated by <√>) which provide the bulk of "word-meaning" and formal syntactic categories (n, v/v*, P, D, C, etc.) which determine morphosyntactic form and distribution.[16] Chomsky (2013, 2015) takes the additional step of making the LA sensitive to the √root vs. category distinction. Thus, Chomsky proposes that roots are invisible to the LA, while categories are visible and will therefore be selected as label in contexts where a category X and a root √Y are combined by Merge (=46):

(46) a. Merge(X, √Y) = [X √Y]

b. Label([X √Y] = [$_{X}$ X √Y] never [$_{√Y}$ X √Y]

c.



It should be noted that this conception of the LA is not merely a stipulation, but is instead motivated by additional principles of the syntactic framework. In particular, Chomsky (2013, 2015) proposes that the LA determines the head of a unit by "Minimal Search"—a principle of minimal computational efficiency—selecting the first (visible) terminal found by a top-down search of a Merge output. In cases where an output consists of two terminals, as in the first step of a derivation, Chomsky introduces the category vs.

[15] Halle & Marantz (1993), Kratzer (1996), Embick (2000), Arad (2003), Doron (2003), Pylkkänen (2008), Ramchand (2008), Foley & Harley (2012), numerous others within Distributed Morphology and root-based conceptions of argument structure.

[16] In the following examples and diagrams, I will use notation adopted by Marantz (1997) for the root vs. category distinction, with categories/categorizers notated by lower-case labels (n, v, etc.). The distinction between v and v* will not be important here, and so I use v for both.

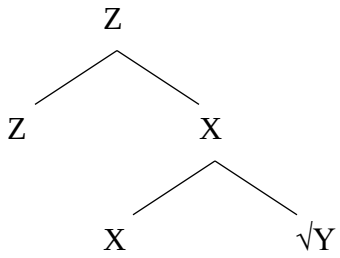
root distinction. At other stages, the label is simply selected by terminal (minimal search) vs. non-terminal (non-minimal search), as shown in (47):

(47) a. Merge(X, √Y) = [X √Y]

b. Merge(Z, [X √Y]) = [Z [X √Y]]

c. Label([Z [X √Y]]) = [$_{Z}$ Z [$_{X}$ X √Y]]

d.



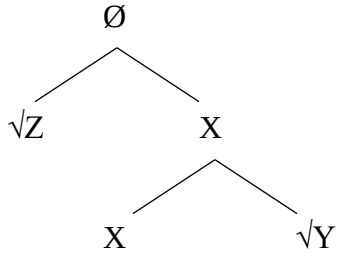
Furthermore, in the tree-structures presented below, I leave the determination of a label selected within a unit consisting of a root and a non-terminal node unspecified (<Ø>). It is unclear how or whether labeling in such a case is to be determined, since the LA is faced with a choice between two elements that it typically rejects as label: a root on one hand and a non-terminal node on the other (=48):

(48) a. Merge(X, √Y) = [X √Y]

b. Merge(√Z, [X √Y]) = [√Z [X √Y]]

c. Label([√Z [X √Y]]) = [$_{ø}$ √Z [$_{X}$ X √Y]]

d.

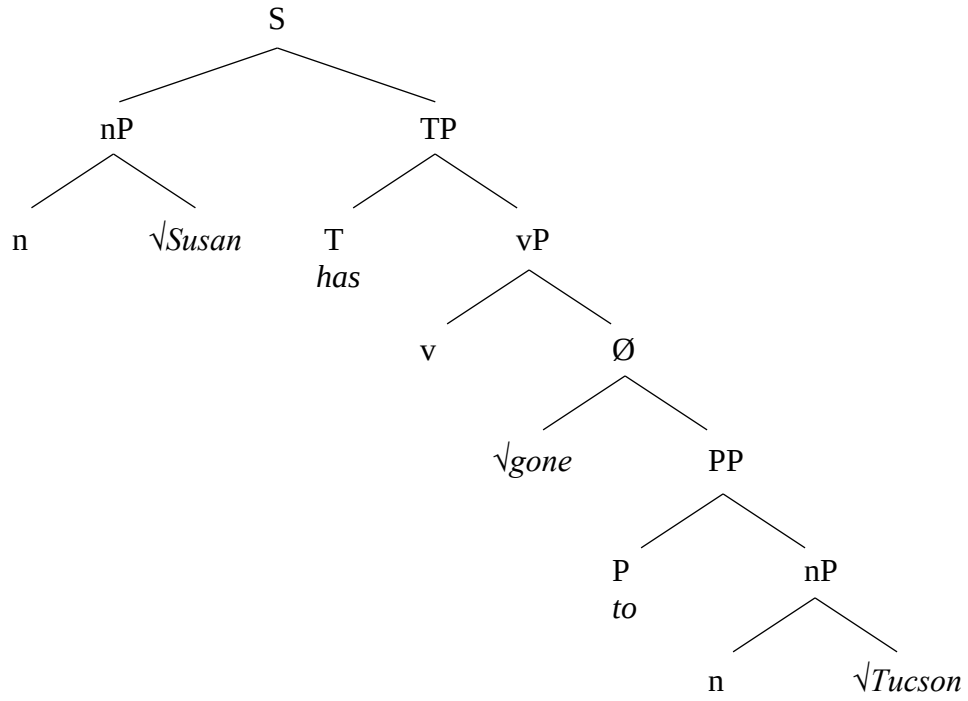


An important consequence of Chomsky's proposal in this respect is a redefinition of the lexical/functional divide. Within the Merge/Label-based system, lexical words

correspond roughly to structures containing lexicosemantic roots, while functional words correspond to formal syntactic categories embedded in larger syntactic phrases. Because of the special sensitivity of the LA (selecting categories over roots), lexical/functional distinctions actually determine the tree-theoretic shape of the units mapped from NS in terms of identities of terminal and non-terminal nodes and relations between them. Let us see how this manifests for the sentence in (49) below. Words/morpheme which have root-status are marked as such <√->, while syntactic categories are taken from the pool of standard formal categories (n, v, T, P, etc.). Projections of categories are indicated informally by XP-notation, i.e. n-nP, v-vP, etc.

(49) a. Susan has gone to Tucson.

b.



Importantly, under basic assumptions of Bare Phrase Structure (Chomsky 1995), a label that is projected to a non-terminal node is formally identical to the terminal node it projects from. Thus, in (49), the terminal nodes T and P, phonologically-realized,

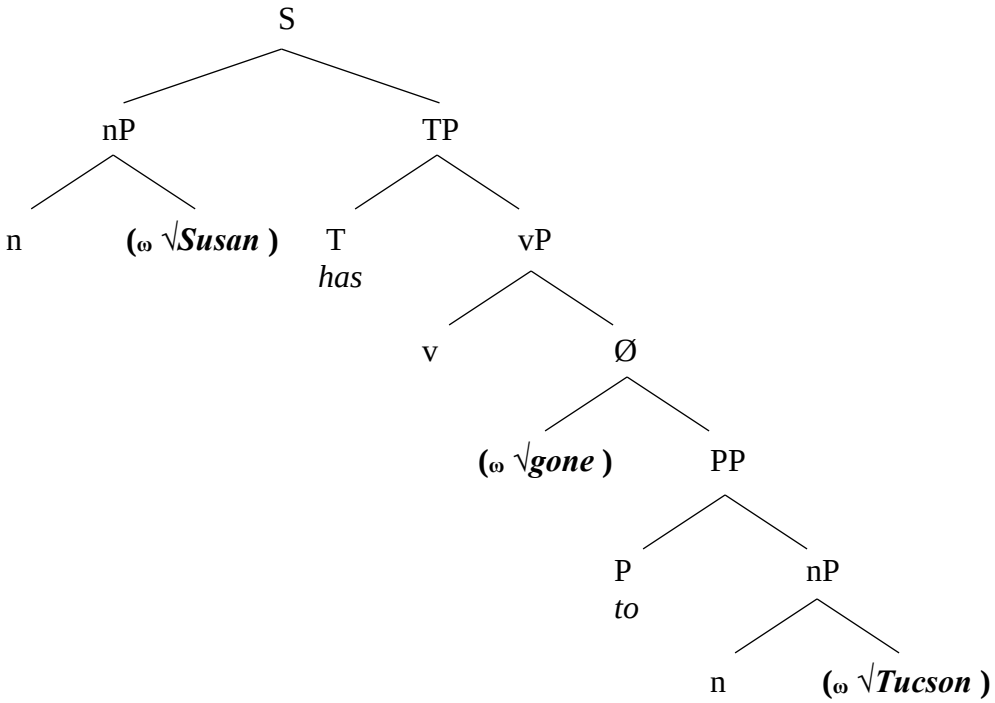
respectively, by *has* and *to*, are projected to the non-terminal nodes immediately dominating them by the LA, and although for convenience we label these higher nodes as TP and PP, they are in principle indistinguishable from T and P themselves. In defining dominance relations in the tree, therefore, if we state that TP immediately dominates vP and PP immediately dominates nP, this also means that T immediately dominates vP and P immediately dominates nP. It is on similar notions that relations like c-command are commonly built, and with these principles in mind, consider the following proposal for syntax-prosody mapping:

(50) **Prosodic Word Assignment Rule (PWAR):** Prosodic words (ω) are mapped from phonological strings associated with syntactic terminals which do not branch.

Applying this proposal to (49), it is clear that the only elements which will receive prosodic word status are the phonological strings associated with √-marked terminals, since these are the only phonologically-realized terminal nodes in the tree which do not project to higher nodes via the LA:

(51) a. (ω Susan) has (ω gone) to (ω Tucson)

b.



This mapping principle provides a simple point of contact between syntactic structure and prosodic domains. In essence, ω-status is assigned to points in the hierarchical structure where further branching or embedding ends. Let's now consider the application to phrase-final instances of functional items, as illustrated in (52) below. In (52a), the preposition *to* is stranded in phrase-final position by fronting of the *wh*-phrase *what city* to Spec-CP, while in (52b) the auxiliary *can* is stranded by ellipsis of a following VP. In the tree-structures for these sentences we will not consider the special left-peripheral articulation of interrogative clauses or the nature of the parallel phrase which licensing ellipsis and will instead focus solely on the structure at the extraction and ellipsis sites. Without committing to any particular theory of syntactic movement (traces, copy-theory, etc.) or ellipsis, we can at minimum posit that the application of these rules results in a

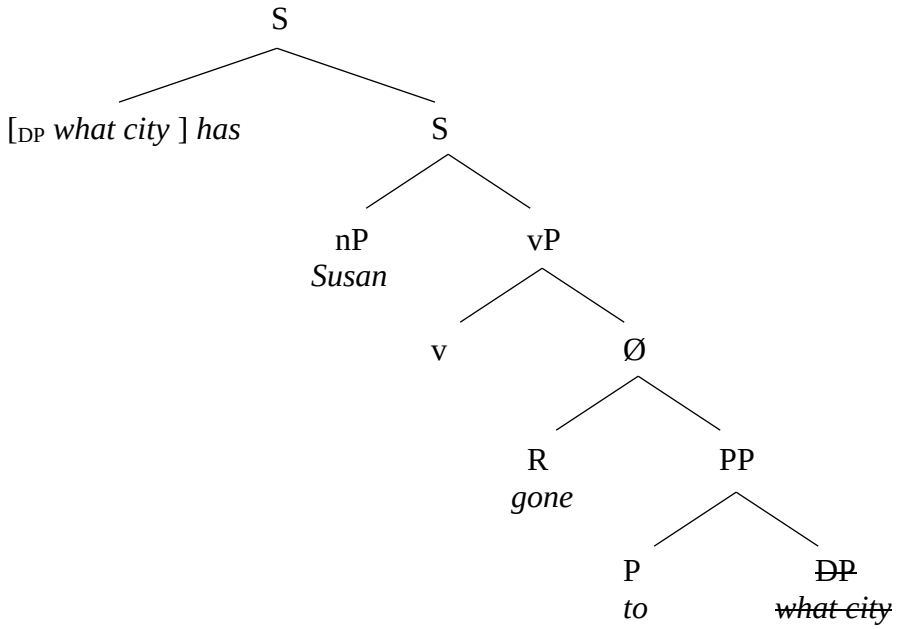
portion of the syntactic structure which is devoid of phonological material, indicated by strikethrough in the following sentences.

(52) a. What city has Susan gone to ~~what city~~?

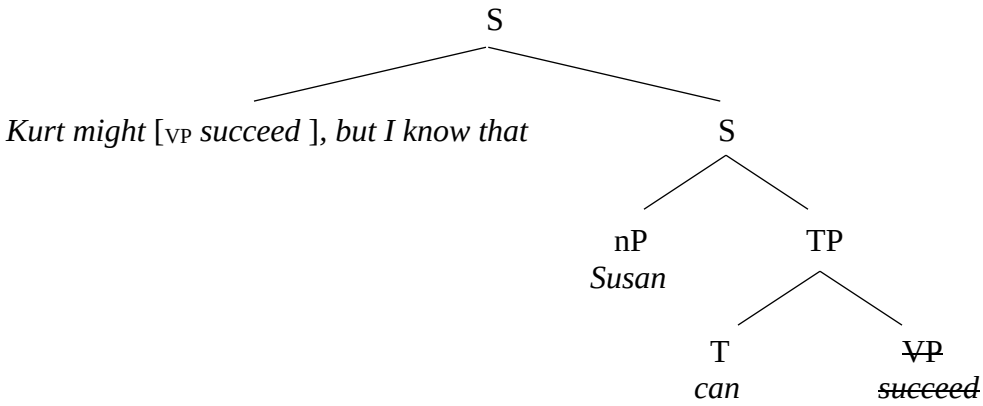
b. Kurt might succeed, but I know that Susan can ~~succeed~~.

These sentences receive the respective tree-structures in (53a-b).

(53) a.



b.



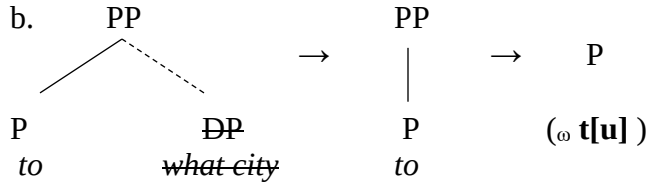
Now consider the following additional proposal for the prosody/syntax mapping:

(54) **Invisibility of Phonologically Null Terminals (IPNT):** Syntactic terminals that lack associated phonological material are ignored/invisible at the interface with prosody.

As a result of the IPNT, a functional item (=syntactic category) which occupies a phrase where all other terminals dominated by that category are phonologically null will be viewed by the phonology as if it dominated no terminals at all, and as a consequence it will not count as a branching node, i.e. just as in the case of lexicosemantic roots. Put another way, a branch of a syntactic representation which contains no phonologically-realized terminals is automatically "trimmed" from the representation used by the prosodic system. Combined with the proposal in (50), this means that the prosodic system will straightforwardly parse the stranded/isolated functional item as a full prosodic word.

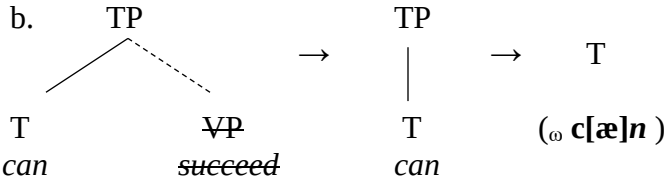
(55) a. … [$_{PP}$ to [$_{\sout{DP}}$ ~~what city~~]] = [$_{PP}$ to] = (ω **t[u]**)

b.



(56) a. … [$_{TP}$ can [$_{\sout{VP}}$ ~~succeed~~]] → [$_{TP}$ can] → (ω **c[æ]n**)

b.



The outcome of these two proposals aligns quite closely with the outcomes reached by Selkirk (1996), Ito & Mester (2009), and Pullum & Zwicky (1997); namely, that when a syntactic phrase contains only a single item, that item is parsed as ω. Unlike these other accounts, however, the current proposal provides an explanation for why there is a

parallel between the prosodic treatment of stranded functional items and full lexical words. In the terms used here, the prosodic system parses the functional item as a ω simply because of how it views the syntactic configuration in which the functional item is embedded. The configurations in which lexicosemantic roots and stranded functional items are found end up being identical as a direct consequence of labeling and principles of BPS.

In addition, the information which feeds ω-formation involves (i) the dominance relations between nodes and (ii) the phonologically null vs. non-null specification of those nodes. For ω-formation, the phonology seeks out only the points in the syntactic structure where a terminal enters into no other identity-relations with non-terminals and assigns that point a specific prosodic status. This can be understood informally as a "stable" point in the tree, and this may hint at the reason why such points feed into ω-formation. Put another way, ω-formation targets the unambiguous "leaves" of the syntactic tree, which usually correspond to lexical words. Items which do not receive ω-status correspond to the "spine" of the tree, usually consisting of functional words.

How does this jive with the non-isomorphic approach? Because syntactic information feeds only low-level prosodic domains, the principles of phonological phrasing outlined in the previous sections may apply to the output of ω-formation without any problem, forming larger phrases based on stress-properties of the prosodic representation, which is annotated for ωs at this point. Crucially, this represents a compromise between the isomorphic and non-isomorphic views. The adoption of a non-isomorphic strategy for the formation of intermediate prosodic domains like the phonological phrase allows us to elegantly capture effects like constraints on lenition and segment-deletion at leading

boundaries in a way that could only be done by stipulation in prior isomorphic frameworks. Even so, the adoption of an isomorphic approach, where prosody is sensitive to specific properties of the syntactic representation, has been shown to be useful and necessary to account for the formation of lower-level prosodic domains like ω, enabling an account of constraints on (ir)reducibility which make reference to the syntactic environment of specific items.

3.5 Conclusion

This chapter introduces an alternative view of prosodic phrasing which does not postulate a direct and isomorphic relation between syntax and prosody. Instead, I adopt here the notion that at least some phonological domains are determined by general principles of language production (rhythm, meter, relative length of domains, etc.). Following work by Lahiri & Plank (2010), I outline the basics of a stress-based algorithm for phonological phrasing and demonstrate that the phenomena of word-initial lenition/flapping and segment-deletion are best captured by such a system, with the outcome being that functional items in English exhibit rampant enclisis. This assertion is supported by a wealth of diachronic, synchronic, and experimental data demonstrating the organization of functional items into adjacent preceding domains and the processes of articulatory strengthening which apply at the leading edges of those domains which tend to arrest processes of weakening.

With this said, I also demonstrate that the phenomenon of (ir)reducibility of function words in specific structural positions ultimately does require reference to information from the syntactic configuration, and I propose a formalization of this relation based on a Minimalist framework of syntax which redefines the lexical/functional divide as an

underlying difference in syntactic formatives whose combination determines the shape of syntactic units, as governed by the labeling algorithm of Chomsky (2013, 2015). Within this system, I propose that syntactic structure determines prosodic structure at the level of prosodic words, which are mapped from non-branching nodes in labeled syntactic structure. I also adopt the idea that phonologically null syntactic terminals are excluded from prosodic processing, with the result that stranded phrase-final functional items are forcibly parsed into prosodic words, preventing phonological reduction. These proposals and the framework they are embedded in provide a basic toolset for examining other linguistic phenomena in English, and the application of both isomorphic and non-isomorphic principles to additional language data will constitute the content of subsequent chapters in this work.

CHAPTER 4

THE SYNTAX OF PHRASAL STRESS AND PROSODIC SUBORDINATION

This chapter focuses on one specific way in which syntactic and prosodic structure are connected: the assignment of phrasal stress (i.e. phrasal pitch accents). After examining typical cases of phrasal stress assignment at the sentence-level in English, I analyze the phenomenon of "prosodic subordination", whereby phrasal stress may be absent from certain words when they occupy the syntactic head-position in a head+complement structure. I develop an account of phrasal stress assignment within a Minimalist framework incorporating Bare Phrase Structure, Merge/Label, and a distinction between root- and category-formatives. Ultimately, I propose that phrasal stress is assigned to non-branching nodes in a syntactic representation (typically, lexicosemantic roots), and show how this rule interacts with surface-level properties of sentences like head-initial versus head-final linearization, the parsing of syntactic movement, and constraints on syntax-prosody uniformity at the level of φ-phrasing and "Major Phrase"-formation.

4.1 Introduction

In the previous chapter, I investigated points of contact between syntactic structure and the system of phonology, concluding that prosodic word structure (which influences phonological processes of reduction) must be mapped from specific configurations created in the module of syntax. Other processes affecting the segmental makeup of words, such as word-initial lenition/flapping, glide-deletion, etc., were found to be better accounted for by principles of phonological phrasing which do not directly reference syntax. Crucially, I advocated for the view that these two sources for prosodic phrasing

do not conflict with each other and that allowing for both makes for a more robust theory of prosodic phonology.

Another area that has generated a great deal of theoretical discussion bearing on the relation between syntax and prosody involves the assignment of stress-prominence beyond the level of word-stress (w-stress). Consider the following sentences:

(1) a. My síster stúdied linguístics

b. My síster stúdied sómething.

c. My síster stúdied in Lóndon.

With the exception of unstressed functional items like *my* and *in*, every word in these sentences bears w-stress (indicated by an acute accent). However, English-users consistently report that certain w-stressed syllables receive additional prominence, typically manifesting as a high-tone pitch accent. Pitch accents are assigned to certain words in a sentence and withheld from others, as indicated by underlining in (1') below.

(1') a. My síster stúdied linguístics

b. My síster stúdied sómething.

c. My síster stúdied in Lóndon.

As shown, pitch accentuation is only available for words that already have w-stress (stress is "preserved under embedding" (Liberman & Prince 1977)), but not every w-stress-bearing word automatically receives a pitch accent. Compare, for example, *studied* in (1'a) versus (1'b-c), where the w-stressed word receives a pitch accent in the latter cases, but not in the former case. The indefinite pronoun *something* in (1'b) also does not receive a pitch accent, despite showing w-stress.

Broadly construed, the rules for the assignment of pitch accents make reference to relations between the constituents of syntactic phrases, and accordingly the term "phrasal stress" or "p-stress" is used in much of the literature[17]. I follow Truckenbrodt (2006) in using phrasal stress and p-stress in order to emphasize the contrast with w-stress. Thus, if w-stress is defined as the assignment of acoustic and perceptual prominence amongst collocations of *syllables*, then p-stress is the assignment of prominence (ultimately manifesting as pitch accentuation) amongst collocations of *words/morphemes* (see Hayes 1995).

One of the basic principles that has been observed in prior work on p-stress assignment is initially illustrated in (1'a), and further exemplified in the bracketed portions of (2)-(4).

(2) a. She [$_{vP}$ <u>stúdied</u>]

b. She [$_{vP}$ stúdied <u>linguístics</u>]

(3) a. She was [$_{DP}$ a <u>stúdent</u>]

b. She was [$_{DP}$ a stúdent of <u>phonólogy</u>]

(4) a. She was [$_{AdjP}$ <u>próud</u>]

b. She was [$_{AdjP}$ próud of her <u>achíevements</u>]

The fact that *studied, student,* and *proud* receive p-stress in the (a)-sentences but may remain unstressed in the (b)-sentences illustrates a phenomenon that Wagner (2005, 2010) terms "prosodic subordination", whereby a word that is typically a candidate for p-stress assignment systematically loss p-stress in the presence of another p-stressed item. This property of p-stress assignment emphasizes the phrasal nature of p-stress, since

[17] Also termed "nuclear stress", "phrasal accent", "sentence accent/stress", "major accent/stress", etc.

prosodic subordination only occurs in specific syntactic configurations; namely, the "head+complement" relation. Additionally, prosodic subordination is not just a local phenomenon, as shown in (5), where *study*, *student*, and *proud* may all remain unstressed even when their respective complements have been fronted. Where necessary, prosodic subordination will be indicated by a wavy underline.

(5) a. What súbject did she stúdy?

b. What súbject was she a stúdent of?

c. Which achíevement was she próud of?

The nature of both local and non-local prosodic subordination and the relation it reveals between syntactic structure and prosody will be the main focus of this chapter. Section 4.2 introduces important background for the definition of p-stress and its interpretation. Internal to that section, section 4.2.1 expands on the small dataset already discussed and describes the syntactic contexts in which prosodic subordination is licensed, while section 4.2.2 reviewes prior theoretical literature and evaluates various proposals aimed at describing and explaining aspects of p-stress assignment and prosodic subordination. Sections 4.3 and 4.4 develop frameworks for understanding the kind of syntactic representation that is used for p-stress assignment and its relevance for prosodic subordination, both local (=4.3) and non-local (4.4). This account is formulated within the Minimalist framework of syntax, assuming Bare Phrase Structure and Merge/Label-based syntax, with a category vs. root distinction. Section 4.5 concludes the chapter.

4.2 Background on P-Stress Assignment

Before delving into the full range of data, there are a few preliminary pieces of information that are important to note. First, in the discussions which follow, we discuss

instances where words may remain "unstressed" due to prosodic subordination. It should be noted, however, that in English the nature of subordination is such that a subordinated word really exhibits optional p-stress, rather than obligatory *absence* of p-stress. Thus, in (2)-(5) above, the interpretation of the sentence does not substantially change if the word which may undergo subordination (i.e. *studied/study, student, proud*) receives p-stress. On the other hand, the non-subordinating words (*linguistics, phonology, achievements, subject*) must have obligatory p-stress in order to maintain the interpretation of the sentence. Notably, this fact appears to be language-specific and dependent on rules of head-linearization (see section 4.3.1 below).

Second, when referencing the connection of p-stress to the interpretation of the sentence, it is important to understand the relation between prominence and information structure; specifically, the interaction between p-stress-prominence and *focus*. The interpretation of a sentence is generally thought to consist of two parts: a *focus* and a *presupposition* (Chomsky 1971, Jackendoff 1972, Szabolsci 1981, Rooth 1985, 1992, Rochemont 1986, Kiss 1998). The focus is the part of the sentence that is excluded from contextual presupposition, and therefore constitutes a specification of "new" information, while the presupposition is equated with "old" information. Question/answer pairs illustrate the distinction between these two parts.

(6) a. What happened? [FOCUS My sister bought a car].

b. What did your sister do? My sister [FOCUS bought a car].

c. What did your sister buy? My sister bought [FOCUS a car].

d. Who bought a car? [FOCUS My sister] bought a car.

In (6a), the question presupposes that an event occurred, and the content of *what* specifies the focus. This is reflected in the broad focus-domain of the answer, which covers the entire sentence (=7a). In (6b-d), in contrast, the presupposition is broader; hence, the focus is narrower, covering the VP in (6b) (=7b), the direct object NP within the VP in (6c) (=7c), and the subject NP in (6d) (=7d).

(7) a. [$_{\text{FOCUS}}$ My <u>sister</u> bought a <u>car</u>].

b. My sister [$_{\text{FOCUS}}$ bought a <u>car</u>].

c. My sister bought [$_{\text{FOCUS}}$ a <u>car</u>].

d. [$_{\text{FOCUS}}$ My <u>sister</u>] bought a car.

The primary prominence of the sentence must fall somewhere within the domain of focus, and the prominence of elements outside the focus-domain is strongly reduced. Internal to the focus-domain, however, there may be multiple prominences, and the relations between these domain-internal prominences will be the center of our attention here. In particular, the type of answer-sentence in (6a) and (7a) provides the clearest picture of prominence-relations within the domain of focus because the domain is the largest. This is typically termed "broad" or "wide" focus, while the smaller focus-domains in (7b-d) are termed "narrow" focus. The widening of the focus-domain to include multiple p-stress-hosting words allows us to perceive "default" patterns of p-stress assignment, i.e. the patterns for how p-stress is assigned to words in the absence of attenuation by focus requirements.

Finally, it is important to identify a parallel factor in the definition of p-stress. Historically, accounts of p-stress have focused on the fact that *rightmost* stress in an English sentence is perceived as "primary", while preceding stresses are "secondary".

This observation has formed the basis of many accounts of p-stress, first and foremost being Chomsky & Halle's (1968) formulation of the "Nuclear Stress Rule (NSR)" for English (see also Selkirk (1996) for English, Hayes & Lahiri (1991) for Bangla, Uhmann (1991) for German). The NSR can be summarized informally as follows:

(8) **NSR:** Assign stress to the rightmost stressable syllable in a configuration [X Y].

The NSR was characterized as a recursive rule, cycling at each major phrase-level (NP, VP, etc.) to derive a single maximum primary (or "nuclear") stress within a syntactic constituent. Notationally, the process of stress-promotion can be represented with columns of stress-marks in a bracketed grid, with the strongest stress in each category (w-stress, p-stress, nuclear stress) projected to the next line up (Liberman & Prince 1977, Selkirk 1980, Nespor & Vogel 1986, Halle & Vergnaud 1987, Hayes 1995). This is illustrated in (9)-(12) below, with (10) showing how prosodic subordination is represented by the non-projection of a stress-mark for p-stress over the verb.

(9)
```
(                x       )        nuclear stress
    ( x     ) ( x       )        p-stress
    ( x     ) ( x       )        w-stress
my  sis.ter   stu.died
```

(10)
```
(                          x       )   nuclear stress
    ( x     ) (                x       )   p-stress          =prosodic
    ( x     ) ( x       ) (    x       )   w-stress          subordination
my  sis.ter   stu.died    lin.gui.stics
```

(11)
```
(                x                   )   nuclear stress
    ( x     ) ( x                   )   p-stress
    ( x     ) ( x       ) ( x       )   w-stress
my  sis.ter   stu.died    some.thing
```

(12)
```
(                          x       )   nuclear stress
    ( x     ) ( x     )      ( x     )   p-stress
    ( x     ) ( x     )      ( x     )   w-stress
my  sis.ter   stu.died   in   Lon.don
```

These sentences illustrate the importance of distinguishing *nuclear stress* assignment (or strongest stress assignment) from *p-stress* assignment. This is due to the fact that the phenomenon we are interested in here—prosodic subordination—only occurs at the level of p-stress. It is at this level that information on, e.g., syntactic constituency plays a role, as indicated in the metrical bracketing of the sentences. The assignment of nuclear stress on the other hand, is ultimately a matter of linear order, promoting the stress of the rightmost column to the top, regardless of its origin. Accordingly, I set the distinction between primary and secondary stress aside for the remainder of this work, focusing instead on distinction between obligatory and optional (i.e. subordinated) stress which only manifests only at the p-stress level. See Truckenbrodt (2006) for further discussion.

4.2.1 Prosodic Subordination

This section expands on the observations made in section 4.1 by incorporating some additional data showing constraints on prosodic subordination. It has already been demonstrated that prosodic subordination occurs in "head+complement" configurations in English, where a simplex item (verb, noun, etc.) combines directly with a complex phrase (DP, PP, etc.). Consider now the minimal pairs in (13)-(15).

(13) a. She [$_{vP}$ studied linguistics]

b. She [$_{vP}$ studied it/something]

(14) a. She was [$_{DP}$ a student of phonology]

b. She was [$_{DP}$ a student of it/something]

(15) a. She was [$_{AdjP}$ proud of her achievements]

b. She was [$_{AdjP}$ proud of them/something]

The (a)-sentences show now-familiar prosodic subordination of a head verb, noun, or adjective in the presence of a complement. The (b)-sentences, however, show that subordination is prohibited if the complement consists of a pronominal item, either definite (*it, them*) or indefinite (*something*). This indicates that p-stress assignment applies to a constituent containing at least the head and complement (vP, DP, AdjP, etc.), and that it assigns *at least one* obligatory p-stress within this constituent. The question of why pronominal or anaphoric items reject p-stress and how this is to be formally represented will be addressed in section 4. below. There, I will propose that pronominal items are syntactically distinct from their phrasal DP counterparts in a way that directly influences how p-stress is assigned.

Sentences (16)-(17) show that a constituent-relation parallel to the "head+complement" relation does not exist between the verb and the sentential subject. When the subject (or a subpart of the subject (=17)) is pronominal, it does not affect p-stress assignment to the verb. (18) shows that the same is true internal to DP: a possessive DP preceding the head noun receives p-stress independently of the head noun (=18a) and p-stress on the head-noun is not affected by a pronominal possessor (=18b).

(16) a. [$_{DP}$ My sister] studied linguistics.

b. [$_{DP}$ She] studied linguistics.

(17) a. [$_{DP}$ A friend of my sister] studied etymology.

b. [$_{DP}$ A friend of hers/someone] studied etymology.

(18) a. [$_{DP}$ [$_{DP}$ my sister's] grasp of linguistics] is solid.

b. [$_{DP}$ [$_{DP}$ her] grasp of linguistics] is solid.

With these facts established, let's consider some additional sentence-types. The sentences in (19) and (20) represent examples of intransitive verbs, i.e. verbs which take a single argument. Two types of intransitives have been identified crosslinguistically: unergatives (=19) and unaccusatives (=20). As can be seen, the underlying difference in verb-type manifests in p-stress assignment.

(19) a. My sister slept.

b. She/someone slept.

(20) a. My sister arrived.

b. She/someone arrived.

Speakers generally prefer p-stress on both the subject and the verb in the case of unergatives, but with unaccusatives, the initial subject is consistently judged to allow prosodic subordination of the following verb (see Irwin 2011 for experimental confirmation of these judgements). This is further confirmed when the subject is pronominal, in which case p-stress on the verb becomes obligatory (=20b).

Unaccusatives are exceptional in this respect, since they appear to go against the trend seen in other sentences whereby the subject is unable to modulate p-stress on the verb. If we consider the broader context of unaccusativity, however, this special property is entirely expected. The consistent marker for unaccusatives across languages is that the single argument of such verbs exhibits properties of an internal argument. The usual assumption is that the subject of an unaccusative originates as an underlying object and then subsequently moves to the preverbal subject position. In English, this property is shown by the fact that many unaccusatives allow insertion of an expletive *there* in subject position, with the verbal argument appearing in postverbal position. As shown in (21), the

postverbal argument allows prosodic subordination of the verb in the same way that an object-argument would.

(21) There arrived a stranger at the station.

There-insertion is much less acceptable for unergatives (*??There slept a stranger, ??There sneezed a stranger*) and totally illicit for transitives (**There studied my sister linguistics*). These observations demonstrate the broader principle introduced in section 4.1: that prosodic subordination may be licensed non-locally, i.e. with reference to the underlying form of a sentence. Thus, in the case of unaccusatives, the availability of subordination is based on the underlying object-status of the surface subject. Bresnan (1971), building on prior observations by Newman (1946), is one of the first to describe instances of non-local subordination. In each of the sentences below, an object DP has been moved leftward from its usual postverbal position. In (22) and (23), the DP undergoes *wh*-movement to form a root and an embedded question, respectively. In (24), the DP undergoes relativization.

(22) a. What subject did she study?

b. What did she study?

(23) a. I wonder what subject she studied.

b. I wonder what she studied.

(24) a. I researched a subject she studied.

b. I researched something she studied.

In the (a)-sentences, the DP that undergoes displacement is non-pronominal and receives p-stress on its own, while in the (b)-sentences the DP is pronominal and does not receive p-stress. Importantly, the moved nominals in the (a)-sentences still allow prosodic

subordination of the now sentence-final verbs, as if the nominals had not undergone movement. The underlying forms of the sentences may be characterized with an unpronounced "copy" of the moved items in their base positions, as in (22-24').

(22') a. What subject did she [$_{vP}$ study ~~what subject~~]?

b. What did she [$_{vP}$ study ~~what~~]?

(23') a. I wonder what subject she [$_{vP}$ studied ~~what subject~~].

b. I wonder what she [$_{vP}$ studied ~~what~~].

(24') a. I researched a subject she [$_{vP}$ studied ~~a subject~~].

b. I researched something she [$_{vP}$ studied ~~something~~].

The significance of non-local prosodic subordination is made even clearer when we look at cases like (25), where subordination clearly functions to resolve ambiguity. In (25a), subordination of the verb *follow* indicates that the DP *instructions* originates from its object position, while non-subordination in (25b) indicates that *instructions* has not undergone movement, i.e. the content of the instructions is that I should follow (someone).

(25) a. I have instructions to follow.

= I have instructions to [$_{vP}$ follow ~~instructions~~].

b. I have instructions to follow.

= I have instructions to [$_{vP}$ follow].

A final piece of information worth noting involves an additional contrast between the class of phrases that license prosodic subordination and those that do not. We have already seen that, with the exception of unaccusatives, the subject of a sentence does not license subordination of a following verb, but this could be seen as a linear restriction, i.e.

subordination may only proceed leftwards in the string (verb < object), not rightwards (subject > verb). The sentences below show that subordination is also restricted in a leftwards direction; namely, when a verb is followed by a phrase classified as an adjunct or modifier.

(26) a. She studied in London.

= She [$_{vP}$ studied] [$_{PP}$ in London].

b. I saw a painting of a house on a cliff.

= I saw [$_{DP}$ a painting of [$_{DP}$ a house] [$_{PP}$ on a cliff]].

(26a) recapitulates (1'c) from section 4.1 above, where a verb is followed by a locative PP. In this case, the presence of the PP does not license subordination of the preceding verb. Likewise, a PP may function as a modifier/adjunct to an DP (=26b) and subordination of the head noun *house* is not licensed. The distinction between a phrase functioning as a *complement* and a phrase functioning as an adjunct may be represented notationally by choice of syntactic bracketing. Thus, in (26), the adjuncts are bracketed as phrases that are adjacent to, but outside of, the phrases they modify (vP and DP, respectively). This differs from the treatment of complement-phrases in prior sentences, which are bracketed internal to vP and DP. Although the precise syntactic status of adjunct-phrases will not be the focus of the accounts in sections 4.3 and 4.4 below, it is important for us to distinguish them as a class separate from complement-phrases.

To summarize this section, we have first established that prosodic subordination is licensed when a head is combined locally with a p-stress-taking complement, unless the complement is pronominal and therefore unable to receive p-stress, in which case subordination is not licensed. Second, we have seen that moved phrases may reconstruct

to their base position for p-stress assignment, licensing subordination when the reconstructing phrase receives p-stress (=non-local prosodic subordination). Finally, adjuncts form a class of syntactic objects which receive p-stress independently and do not interact with other objects in such a way as to license subordination.

4.2.2 Prior Accounts of P-Stress

Many proposals have been made to capture patterns of p-stress assignment since the Nuclear Stress Rule. We will focus here on frameworks that acknowledge the phenomenon of prosodic subordination, starting with one of the more enduring descriptive generalizations developed by Gussenhoven (1983, 1992): the "Sentence Accent Assignment Rule (SAAR)":

(27) **SAAR:** If focused, every predicate, argument, and modifier must be accented, with the exception of a predicate that, discounting unfocused constituents, is adjacent to an argument.

The SAAR identifies three different syntactically- and semantically-defined formatives to which p-stress is assigned within a focus-domain. A single exception is made for prosodic subordination in the case of predicates when they are adjacent to an argument. This appeal to adjacency is important for capturing the facts for unaccusatives in (20) above, since it does not require any particular directionality between the argument and predicate. (28) shows examples of p-stress assignment in each of these cases:

(28) a. [My sister]$_{\text{ARGUMENT}}$ [studied]$_{\text{PREDICATE}}$

b. [My sister]$_{\text{ARGUMENT}}$ [studied]$_{\text{PREDICATE}}$ [linguistics]$_{\text{ARGUMENT}}$

c. [My sister]$_{\text{ARGUMENT}}$ [studied]$_{\text{PREDICATE}}$ [in London]$_{\text{MODIFIER}}$

d. [My sister]$_{\text{ARGUMENT}}$ [arrived]$_{\text{PREDICATE}}$

Note that the SAAR does not clearly take care of cases like unergatives, where the predicate does not undergo subordination to its argument. Neither does it make a detailed statement about how p-stress is to be assigned within each formative, which may have substantial internal structure. Nevertheless, the SAAR captures the core data neatly, and much related work has built on it as a useful generalization. For our purposes, the SAAR illustrates the need for defining how p-stress is assigned in head-complement (and specifier-head) configurations, and to adjuncts.

One attempt at sketching out the mapping between p-stress and fine syntactic structure is Cinque's (1993) proposal using depth of embedding. Cinque notes that, under basic assumptions of X-Bar Theory, (primary) p-stress is always assigned to the most deeply embedded phrase in a sentence. This is formalized using the cyclic nature of the NSR whereby stress-assignment applies at certain syntactic nodes (XPs). Thus, the higher the number of cyclic nodes dominating a stress-bearing item, the higher its stress will be. This not only accounts for p-stress assignment inside each of the formatives identified by the SAAR, it also provides an explicit reason for the general avoidance of p-stress on functional items, since they are typically hierarchically higher than lexical categories, as well as prosodic subordination: p-stress avoids the verb in favor of its object argument because the object is more deeply embedded. Although Cinque's algorithm requires a great deal of fine-tuning (see Zubizarretta (1998) for related proposals attempting to capture more crosslinguistic data), the basic generalization remains robust. However, it should be noted that Cinque's account does not actually address p-stress as we have defined it. It addresses *primary* stress, following the same reasoning as the NSR which ignores all p-stress but the strongest—and typically rightmost, in English. This leads the

account to an impasse, since it cannot deal with cases where, for example, the subject DP is more syntactically complex than the vP, as in (29):

(29) $[_{DP}$ A friend [of [Susan $]_3$ $]_2$ $]_1$ $[_{vP}$ studied [pragmatics $]_2$ $]_1$

If p-stress were truly sensitive to embedding-depth, it should assign primary stress to *Susan* (depth of embedding=3), rather than the object *pragmatics* (depth of embedding=2) but this is not the case. The main takeaway is that while Cinque's proposal may be correct in targeting syntactic embedding as a relevant factor, the algorithm as outlined by Cinque is too fine-grained in its sensitivity to syntax. It appears that, at its base level, p-stress assignment ignores distinctions like primary versus secondary stress and instead targets specific stable points in syntactic structure.

An Optimality Theoretic account developed by Truckenbrodt (2005) takes up Cinque's core generalization but reformulates in such a way that it avoids the issue of course/fine-grain sensitivity. Truckenbrodt proposes that p-stress is governed by a ranked constraint STRESS-XP requiring every phrase (XP) to contain a specification of p-stress. Unlike Cinque's account, Truckenbrodt's proposal is able to simultaneously describe patterns of both secondary and primary p-stress, and also to characterize the contexts in which prosodic subordination occurs.

Truckenbrodt's central assumption is that STRESS-XP is satisfied if p-stress occurs *at some position* inside an XP. The most efficient way to satisfy the constraint, given a sequence of recursively embedded phrases, is to assign a single p-stress within the most deeply embedded XP. All XPs containing this stressed XP will then satisfy the constraint. Note that, in order to define the notion of "efficiency" evoked above, this system should

also be paired with a constraint that limits the number of p-stresses ("MIN-STRESS" below). The application of these two constraints is shown in (30):

(30)

[XP X [YP Y [ZP Z]]]	**STRESS-XP**	**MIN-STRESS**
a. [XP X [YP Y [ZP Z]]]		***
b. [XP X [YP Y [ZP Z]]]		**
→ c. [XP X [YP Y [ZP Z]]]		*
d. [XP X [YP Y [ZP Z]]]	*	**
e. [XP X [YP Y [ZP Z]]]	**	*
f. [XP X [YP Y [ZP Z]]]		**

This combination of constraints can successfully describe most of the phenomena discussed above, with some modifications for unstressed items and moved phrases. Importantly, Truckenbrodt (2006:7-8) notes that both STRESS-XP and Cinque's depth-based algorithm have an advantage over the original SAAR in that they need not write special properties of syntactic configurations (head+complement, predicate+argument, etc.) into the rules for p-stress assignment. Instead, phenomena like prosodic subordination and p-stress assignment to adjuncts come about as a natural result of these algorithms. Even so, one of the larger theoretical challenges faced by nearly all the proposals discussed so far concerns the question of what specific syntactic primitive or configuration the prosodic system interact with. Both Cinque's and Truckenbrodt's respective frameworks depend on the successful definition and identification of a syntactic level "XP" (just as the NSR cycles at every "phrasal" node). This is not a problem within a syntactic system which incorporates the primitives of X-Bar Theory.

However, many generative approaches since Chomsky 1995 adopt principles of Bare Phrase Structure (BPS), which eliminate labels like XP or X' as primitives of syntax. My goal here is to develop proposals that fit within a unified theory of prosody-syntax mapping, and such a theory must be explicit about the basic elements of the prosodic and syntactic frameworks being used. Since I will ultimately adopt a BPS-framework in the vein of Chomsky (2013, 2015), with operations like Merge, Label, and Transfer applying to objects containing various formatives, constraints like STRESS-XP or proposals which replicate the core generalizations made by Gussenhoven, Cinque, and Truckenbrodt will by necessity need to be reformulated.

I conclude this section by discussing the properties of a final class of frameworks which bring the interface-relation between syntax and prosody to the forefront. These systems, exemplified in work by Kahnemuyipour (2004, 2009), Kratzer & Selkirk (2007), Adger (2007), and Ahn (2015), adopt a phase-based approach to syntactic derivation (Chomsky 2001-2008) whereby syntactic structure is formed in a series of "chunks", each of which is constructed within the Narrow Syntax (NS) and then mapped to other systems by the operation of Transfer.

Within NS, Transfer is triggered by an application of Merge which introduces a "phase-head" into the derivation. Phase-heads consist minimally of the syntactic categories C (complementizer) and v* (transitive verbal category). Once triggered, Transfer removes from NS a portion of the derivation corresponding to the structural sister (or "complement") of the phase-head: TP for the CP-phase and VP for v*P-phase. This two-phase division for a typical sentence is schematized in (31) below, and the simplified

derivation of this sentence is in (32)-(33), with (32) illustrating the construction of the v*P-phase and (33) the CP-phase:

(31) [C [$_{TP}$ [$_{NP}$ Sue] [has$_T$ [v* [$_{VP}$ studied$_V$ [$_{NP}$ linguistics]]]]

CP-Phase **v*P-Phase**

(32) a. Mrg(studied$_V$, [$_{DP}$ linguistics]) = [$_{VP}$ studied$_V$ [$_{DP}$ linguistics]]

b. Mrg(v*, [$_{VP}$ studied$_V$ [$_{DP}$ linguistics]]) = [$_{v*P}$ v* [$_{VP}$ studied$_V$ [$_{DP}$ linguistics]]]

c. Transfer([$_{VP}$ studied$_V$ [$_{DP}$ linguistics]]) = [$_{v*P}$ v* …]

(33) a. Mrg(has$_T$, [$_{v*P}$ v* …]) = [has$_T$ [$_{v*P}$ v* …]]

b. Mrg([$_{DP}$ Sue], [has$_T$ [$_{v*P}$ v*…]]) = [$_{TP}$ [$_{DP}$ Sue] [has$_T$ [$_{v*P}$ v*…]]]

c. Mrg(C, [$_{TP}$ [$_{DP}$ Sue] [has$_T$ [$_{v*P}$ v* …]]]) = [$_{CP}$ C [$_{TP}$ [$_{DP}$ Sue] [has$_T$ [$_{v*P}$ v*…]]]]

d. Transfer([$_{TP}$ [$_{DP}$ Sue] [has$_T$ [$_{v*P}$ v* …]]]) = [$_{CP}$ C …]

Once Transfer has applied, the transferred material is no longer accessible to syntactic operations within NS, and this generalization forms the main theoretical outcome of phase-based syntax, the "Phase Impenetrability Condition (PIC)" which limits the range of syntactic operations (movement, agreement, expletive selection, etc.) to relatively small stretches of a derivation. The PIC constitutes a substantive constraint on an otherwise powerful generative engine defined by recursive Merge.

The application of phase-theoretic syntax to p-stress assignment has the potential to clarify the limited domains within which p-stress is specified. As an initial example, Adger (2007) adopts the basic form of the NSR, but relativizes it to a phase-domain. Recall that the NSR simply promotes the rightmost stress in a domain. If the domains are

defined as the phases v*P and CP, the result is that the rightmost stress in each domain will be promoted. For (31), this means that both the subject and the object will receive p-stress, while the verb will not, as shown below[18]:

(34)

	(		x		)	(			x		)	p-stress
			(	x	)			(	x	)	(	x	)	w-stress
C	**[TP**	my		sis.ter	has	**v***	**[VP**	stu.died		lin.gui.stics	**]]**			
				CP-Phase						**v*P-Phase**				

This does not have much of an advantage over older proposals, however, since it simply recapitulates the cyclic nature of the NSR: the rule for p-stress assignment iterates at each phase instead of at each cyclic node, meaning that Adger's account is essentially a restatement of the NSR in phase-theoretic terminology. Other phase-based accounts differ from Adger's in the kind of algorithm that is assumed, however. In particular, two major accounts by Kahnemuyipour (2004, 2009) and Kratzer & Selkirk (2007) share the same basic assumption that p-stress is actually assigned to the *structurally highest* XP within a phase-domain. Put another way, p-stress is assigned to the *first* XP found by top-down search inside a phase. This is actually the inverse of Cinque's original depth-based algorithm—what we might call the "height-based" algorithm for p-stress.

The motivation for this analysis comes from observations from languages like Persian and German, which allow head-final constructions where p-stress appears to be assigned in a leftwards fashion. I will review some of this data and the conclusions that may be drawn from it in section 4.3.1 below. For now, it suffices to say that, combined with theoretical principles like Kayne's (1994) Linear Correspondence Axiom which assumes

[18] This is a marked simplification of Adger's proposal. Adger assumes that DPs are also phases, and this is why both the subject and object receive stress within their respective phases. I have simply collapsed the p-stress assignment at the DP-phase with already-present w-stress. Promotion of the p-stress of the object over the subject (=classic nuclear stress) also occurs at the CP-phase, since the object is rightmost.

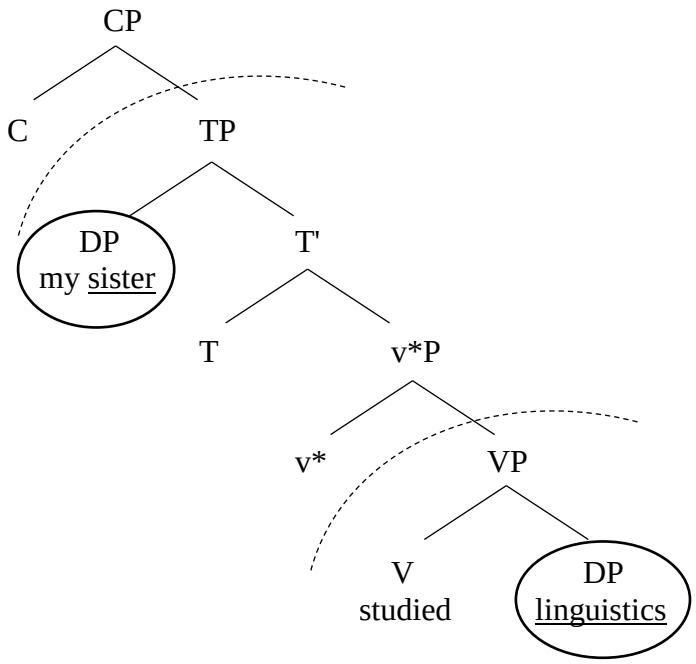
that linear order tends to reflect hierarchical order, these authors interpret leftwards p-stress assignment as indicating that the phrases which receive p-stress are structurally higher up.

Kratzer & Selkirk's (2007) application of the height-based algorithm to English illustrates (=35). Here, assignment of p-stress to the highest XP is straightforward for the subject phrase, which occupies the Spec-TP position and is highest within the CP-phase. In the case of objects within the v*P-phase, the authors propose that the object DP is selected over the verb because the algorithm which determines p-stress assignment ignores the highest node in the phase-domain: VP, in this case. The next highest XP within the v*P-phase is the DP-object. In the tree-representation below (=35b), phase-domains are demarked by dotted lines.[19]

(35) a. [C [$_{TP}$ [$_{DP}$ my sister] [$_{T'}$ has [$_{v*P}$ v* [$_{VP}$ studied$_{V}$ [$_{DP}$ linguistics]]]]]]

= My <u>sister</u> has studied <u>linguistics</u>.

b.



[19] The authors characterize p-stress assignment as a matter of prosodic phrasing. P-stress is termed "major stress" and is associated with the prosodic constituent of "Major Phrase (MaP)".

Due to the nature of the height-based algorithm, prosodic subordination comes about as a function of the fact that p-stress is assigned once per phase. Thus, within each phase, the algorithm chooses the single highest XP and ignores everything else. This predicts that the number of p-stresses in the surface form of a syntactic object directly correlates with the number of phases in that object. This is an interesting prediction, and it is worth considering some additional data that Kratzer & Selkirk do not address. In particular, we may ask about the structure of ditransitive verbs, as in (36):

(36) My sister sent my father a present.

Both the direct and indirect objects receive p-stress under broad focus. Within the phase-based framework, this would have to be analyzed as evidence that the sentence is divided into three phases, one for each argument.

(36') [PHASE My sister [PHASE sent my father [PHASE a present]]]

Importantly, this is not a typical treatment of the v*P-phase, which is normally characterized as a domain in which thematic roles are fully established (Chomsky 2001). The necessary subdivision of the ditransitive v*P-phase into multiple subphases in response to p-stress evidence potentially diminishes the value of theta-assignment as a means of defining the v*P-phase.

The nature of adjuncts is also unclear. If we assume that there is a single unified algorithm for p-stress assignment, rather than multiple algorithms, the fact that modifying phrases (PPs, AdjPs, possessive DPs, etc.) appear to receive p-stress independently leads to the conclusion that individual adjuncts must occupy separate phase-domains.

(37) My sister studied in London with my friend for a year …

= [PHASE My sister [PHASE studied] [PHASE in London] [PHASE with my friend]

[PHASE for a year] …

(38) My sister's fascinating book on syntax

= [PHASE My sister's] [PHASE fascinating] [PHASE book] [PHASE on syntax]

The potential blow-up of the number of distinct phase-domains can be seen as a drawback for phase-based theory, since it seems possible to simply postulate an extra phase-domain for every additional p-stress that arises, weakening the explanatory power of phase-theoretic syntax. This issue is specifically tied to the definition of the p-stress algorithm as a phase-level operation which selects a *single* phrase for p-stress assignment, paralleling the problems faced by Cinque's depth-based algorithm, which focused on selecting a single primary p-stress and, therefore, was not able to adequately account for the relative strength of other p-stresses. Similarly, the "highest-XP" phase-based approach can only solve the issue of multiple p-stresses by postulating multiple phase-domains.

Having discussed some of the major influential proposals for p-stress assignment in the literature, I will present in the next section an account which incorporates the descriptive generalizations of the SAAR, STRESS-XP, and phase-based approaches, but is unique in that it is situated within a framework of syntax that is in many ways different from prior accounts. The major distinction is that the account proposed here adopts a framework of syntax which adheres to principles of Bare Phrase Structure, eschewing the primitives of X-Bar Theory. It is notable that the majority of prosody/syntax accounts continue to rely heavily on X-Bar theoretic definitions of primitives like "XP" and "X'"

in order to state the relevant mappings. This is true not only for postulated constraints like STRESS-XP (which only function if prosody is able to identify and distinguish primitives like head-, phrase-, and bar-level), but also within phase-theoretic frameworks, where, for example, the p-stress algorithm must distinguish between "Spec-TP" (=the subject phrase) and T' in order to correctly assign p-stress to the former (see (35) above), and not the latter.

With this said, the point here is not that X-Bar theory is a failure. On the contrary: principles of X-Bar theory have provided an immensely useful and flexible system for describing syntactic structures and phenomena across languages. However, it is clear that, despite its descriptive usefulness, X-Bar theory does not truly achieve explanatory adequacy, since it amounts to a set of stipulations about how syntactic phrases should be organized. The recognition of this shortcoming has been the motivation for much of the growth of syntactic theory over the last twenty-plus years, following Chomsky (1995), and recent proposals have attempted to push beyond these stipulations to understand the broader computational principles which shape syntactic structure. It is worth exploring how and whether these changes in our understanding of syntactic form provide new insights into prosodic form as well.

4.3 An Account of Syntax-Based P-Stress Assignment

I adopt the approach to syntax outlined in Chapter 2, following proposals by Chomsky (2013, 2015). To summarize, syntactic structure is built within Narrow Syntax by Merge, a binary, recursive, combinatory operation. The output of Merge is then subject to the Labeling Algorithm (LA), which exploits asymmetries between the constituents of the Merge-output by selecting one constituent as the projecting "head". The LA operates by a

principle of Minimal Search, selecting the first visible terminal node found by top-down search of a Merge-output. In addition, the formatives that serve as inputs to Merge are divided into two classes, acategorial lexicosemantic "roots" (marked with <√->) and syntactic categories (v, n, D, P, T, etc.), the former of which are invisible to the LA and may not project as label. This means that individual outputs of Merge fall into one of five types:

(39) a. [X Y] **category + category**

b. [√X √Y] **root + root**

c. [[$_{XP}$ …] [$_{YP}$ …]] **phrase + phrase**

d. [X √Y] **category + root**

e. [X [$_{YP}$ …]] **category + phrase**

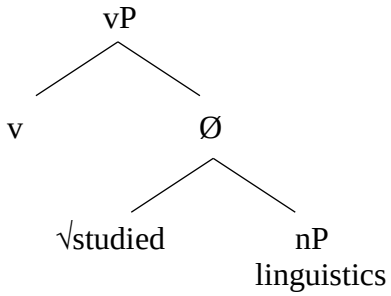
f. [√X [$_{YP}$ …]] **root + phrase**

The first three types (=39a-b) I will set aside, since label-determination in these cases is unclear. Chomsky (2013) claims that (39a) at least cannot be labeled, and (39b) is presumably to be treated the same, while (39c) must be labeled by alternative means (feature-sharing/agreement on the heads of both phrases). Regardless, these structures will not play a role in the following discussion. This leaves (39d-f), which consist of a category combined with a root, and a category and root, respectively, combined with a prior output (informally, a "phrase", indicated by the YP notation) by recursive application of Merge. (39d) and (39e) are labeled trivially by the Minimal Search-based LA, since X in each case is the first eligible terminal found by a top-down search: [$_{XP}$ X √Y] and [$_{XP}$ X [$_{YP}$ …]].

In contrast, Chomsky (2013, 2015) does not directly address how the LA should treat a structure like (39f), since a top-down search yields two results which are not eligible for labeling: a root √X and a non-terminal node YP.[20] In the previous chapter, I simply assumed that no label was determined in this case: [$_{Ø}$ √X [$_{YP}$ …]]. Notably, however, this specific type is the direct manifestation within the current framework of the configuration that I have termed "head+complement" in the above discussion of prosodic subordination.[21] It arises in both verb+object (=40) and noun+PP-complement (=41) configurations. Following basic assumptions of Marantz (1997), Borer (2005), and Chomsky (2013, 2015), in each case, a root is combined directly with a complex phrase representing the argument, and a syntactic category (e.g., N, v, etc.) is merged to the outcome:

(40) She studied linguistics.

= … [$_{vP}$ v [$_{Ø}$ √studied [$_{nP}$ linguistics]]]

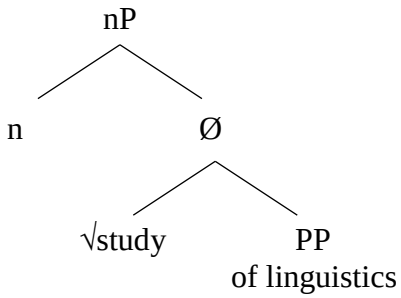


[20] Chomsky (2015) uses the notation "RP" as notation to reference the syntactic constituent containing a root+phrase combination, but does not address the actual question of labeling such a structure.

[21] The "head+complement" terminology is a misnomer within the current framework due to the introduction of the root vs. category distinction. The root is not the "head" because it does not technically project as label (so far as we have seen). Even so, the bare structural configuration is identical, consisting of a terminal node instantiating a predicate and a sister non-terminal instantiating an argument: [predicate [argument]].

(41) her study of linguistics

= … [$_{nP}$ n [$_{Ø}$ √study [$_{PP}$ of linguistics]]]



Having established that this is the structural configuration in which prosodic subordination is licensed, I propose the following "Phrasal Stress Assignment Rule (PSAR)", which closely parallels the proposal made for the formation of prosodic words in Chapter 2:

(42) **PSAR:** Phrasal stress is assigned to non-branching nodes.

(i) Terminal nodes projected by the LA are identified as branching nodes for p-stress assignment.

Given (i), it is important to note that, under assumptions of Bare Phrase Structure, there is no formal distinction between the terminal and non-terminal instances of a node which has been projected as label by the LA. Thus, in (40) and (41) above, although a notational difference is employed to distinguish v from vP and n from nP, BPS operations are assumed to be insensitive to this distinction, and the nodes are treated as identical. The crucial point for the PSAR, therefore, is that nodes which project as label are identified as branching nodes for the purposes of p-stress assignment. In other words, when the PSAR applies to a syntactic representation, it identifies the projection of v, n, etc. (notated by vP, nP) and assigns no p-stress, ignoring the terminal node that the label

was projected from. In this sense, the PSAR follows a principle very similar to the principle of top-down Minimal Search (MS) which guides the LA.

As stated, the PSAR will target all and only instances of roots, because of their non-labeling properties, which prevent them from being identified with branching nodes by projection. This covers the general tendency for assignment of p-stress to lexical words, which also happen to be parsed as prosodic words. This does not, however, explain the licensing of prosodic subordination, which amounts to the optional suspension of p-stress assignment to roots which occupy the structural positions in (40) and (41).

To explain this, consider the root+phrase configuration in the light of the LA itself. The LA is constrained to apply via MS. This means that it searches downward from the top node of a Merge-output and selects as label the first eligible terminal that it finds. In contexts like (39d) where it finds two terminal nodes—one a root and the other a syntactic category—it ignores the root and selects the category. This could be because the LA treats the root as being more complex than the category (i.e. requiring further search), but I will not explore precisely what makes roots different from categories here. The same situation holds of (39e), where the LA faces a choice between a category and a non-terminal node which would require further search. By MS, the LA selects the category, rather than searching further for a different label.

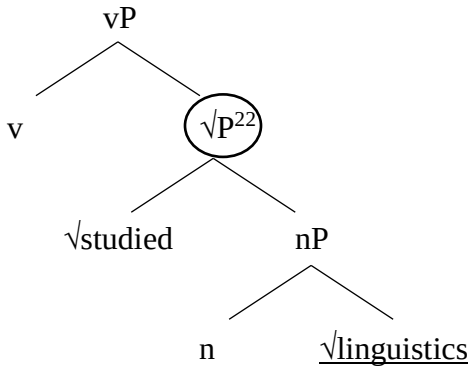
Now consider (39f), (40), and (41) again. Here, the LA faces a choice between, on one hand, a terminal node consisting of a root and, on the other hand, a non-terminal node. Both of these types are typically rejected by the LA in other contexts, and so no label is determined. I propose that this outcome is precisely what makes such a configuration unique: the root, in this case, occupies a structural position typically occupied by items

which project as label (i.e. a terminal node sister to a non-terminal node), but it does not actually label. I propose that these structural properties introduce ambiguity into the syntactic representation which is ultimately subjected to the PSAR.

When the PSAR encounters an ambiguous configuration of this type, two options are available: it may either treat the root as a labeling item or as a non-labeling item. In the former case, the root does not fall under the PSAR and p-stress is not assigned. In the latter case, the PSAR applies to the root straightforwardly. This, I claim, is the origin of optional prosodic subordination. It is a surface reflection of a systematic ambiguity induced in the syntactic structure by the application of a MS-based LA. The tree structures in (43a-b) indicate the different possible representations that the PSAR may use.

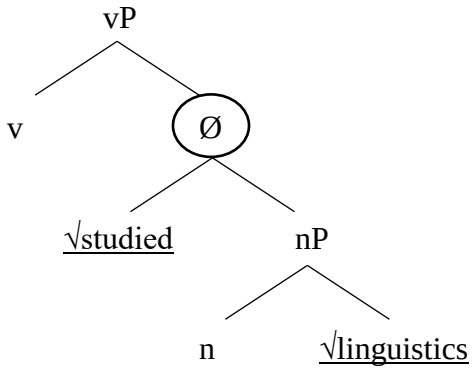
(43) a. She studied <u>linguistics</u>.

= [$_{vP}$ v [$_{√P}$ √studied [$_{nP}$ <u>linguistics</u>]]]



b. She <u>studied</u> <u>linguistics</u>.

= [$_{vP}$ v [$_{Ø}$ <u>√studied</u> [$_{nP}$ <u>linguistics</u>]]]



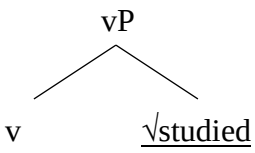
This approach to the relation between the PSAR and syntactic structure explains why prosodic subordination is completely unavailable in the absence of a complement-phrase:

[22] It should be emphasized that the use of "√P" here is not intended to indicate that √*studied* actually does project as a label in the syntax; only that the root occupies a position that is ambiguous enough for the PSAR to interpret it as labeling. Thus, the relevant ambiguity arises at the level of PSAR-application, not at the deeper level of LA-application.

no ambiguity exists as to the labeling-status of the root. In the absence of a complement, the root combines directly with its category (v, n, etc.), and there is no possibility of projection.

(44) She studied.

= … [$_{vP}$ v √studied]



With the establishment of the PSAR and the identification of the ambiguity that leads to optional prosodic subordination, our next challenge is to explain why pronominal objects do not license prosodic subordination. The facts from (12) are repeated below:

(12) a. She [$_{vP}$ studied linguistics]

b. She [$_{vP}$ studied it/something]

Within the system we have developed here so far, something about the nature of pronominal items must change the syntactic configuration of the vP in order for the PSAR to assign obligatory phrasal stress to the verb. This should involve a change in the precise position of the root within the structure, one that prevents the creation of an ambiguous configuration for the root as in (43). Importantly, the labeling framework does provide us with a straightforward means of representing this change, one that has been conceptually articulated and supported in much prior work. In particular, special properties of pronouns across languages have long been attributed to their syntactic structure. Abney (1987), Cardinaletti & Starke (1994, 1999), Cardinaletti (1994), and Ritter (1995) all articulate, in one form or another, the idea that weak (unstressed,

unfocused) pronominal items are syntactically "deficient", lacking the full structure of other nominal items in a reflection of their dependent and referential nature.

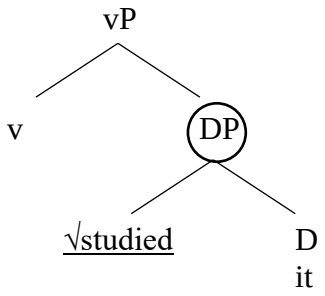
I will here adapt the general approach of Cardinalleti & Starke (1994, 1999), who present multiple syntactic options for pronouns within X-Bar Theory. In short, the authors propose that pronouns may be instantiated either as branching or non-branching XPs. In Bare Phrase Structure terms, this amounts to the possibility of pronouns existing as either phrases (XPs) or heads (Xs), and within the root/category paradigm adopted here, I propose that, in English, pronouns may be instantiated by default as non-root syntactic categories.

(45) **Proposal:** Pronouns are non-root category-type elements.

Following Cardinalleti & Starke's (1994) terminology, this proposal primarily applies to "weak", rather than "strong", pronouns, of which English definite pronouns (*she, he, it,* etc.) are classic examples, due to their generally small prosodic and phonological footprint and susceptibility to phonological reduction. Strong forms of pronouns in English generally involve focus prominence (*I saw HER. SHE is the one I saw.*), which independently promotes phrasal stress prominence to achieve special discourse-pragmatic effects. Because of this, the precise status of strong pronouns falls outside of our focus on the default assignment of phrasal stress, and the strong/weak distinction will not otherwise play a role here. By convention, I use the label D (=determiner) to indicate the category of weak pronouns, and the proposal in (45) plays out in interesting ways, as illustrated in (46):

(46) She <u>studied</u> it.

= … [$_{vP}$ v [$_{DP}$ <u>√studied</u> it$_{D}$]]



In this case, the fact that the pronoun is a non-root category leads to an absence of labeling ambiguity when it is combined with a root. The pronoun is selected by the LA in all cases, projecting to the higher node (and counting as a branching node for the purposes of the PSAR) and this blocks any possibility of the root occupying an ambiguous position where it could be interpreted as a projecting node, eliminating the option that leads to prosodic subordination at the level of PSAR-application. This means that the incorporation of a pronoun into vP as an object yields the same result as the intransitive structure in (44), where the only way that the PSAR may apply is to assign phrasal stress to the root.[23] With these proposals in mind, I turn now to another property of prosodic subordination: the relation between optional subordination and linear order.

[23] Questions arise about the interpretation of the relation between the pronoun and the root: if the pronoun projects as the label of [√studied it$_{D}$], does this make correct predictions with respect to the interpretation of this structure? Frequently, the projecting head of a syntactic relation is interpreted as the predicate or selector, and so the structure in (46) might appear to make incorrect predictions at first glance. However, it is important to clarify the role of the LA in selecting a "head". Chomsky (2013, 2015) characterizes the LA in more general terms: as an algorithm which identifies properties of syntactic objects for interpretation at the interfaces. The LA is primarily concerned with the identification of asymmetries within syntactic objects, and it is unclear whether or not the precise directionality of a particular asymmetry (i.e. whether or not D vs. the root projects over the other) is important, rather than simply the presence of an asymmetry (i.e. D and the root have some asymmetric relation to each other). I will tacitly assume the latter interpretation of the LA, leaving the precise details to be developed in future work.

4.3.1 Head-Initial vs. Head-Final Constructions

An additional goal of this account is to capture crosslinguistic differences in prosodic subordination. One apparent point of variation identified by Wagner (2005, 2010), Truckenbrodt (2006, 2010), and Kratzer & Selkirk (2007) relates to head-linearization. In an English-type language, prosodic subordination is generally optional, as shown in the foregoing sections. In other languages, however, such as German and Persian, prosodic subordination is invariably obligatory when the word undergoing subordination is found in a "head-final" construction. I use data from German to illustrate, adapted from Truckenbrodt (2006, 2010) and Selkirk & Kratzer (2007). In standard SVO sentences in German, prosodic subordination of the verb is reported to be optional, just as in English.

(47) *Sie studierte Linguistik.*
she studied linguistics
"She studied linguistics."

When the typical position of the finite verb is filled by an auxiliary or a complementizer, the (non-finite) verb obligatorily occupies a position to the right of the direct object in a mirror image of the English vP. Crucially, in this context, the verb must be prosodically subordinated. There is no optional p-stress.

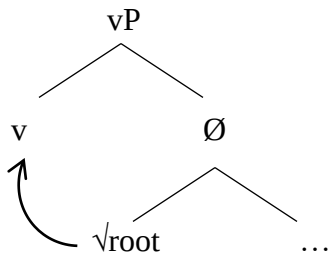
(48) a. *Er hat Linguistik studiert.*
b. **Er hat Linguistik studiert.*
He has linguistics studied
"He has studied linguistics."

Most prior accounts of this phenomenon are descriptive in nature, either leaving an explanation to future work or proposing a descriptive constraint. As an example, consider

Kratzer & Selkirk's (2007) phase-based proposal whereby the optionality of subordination in English is tied to optionality of prosodic domain formation. Within a phase, (primary) p-stress is assigned to the first XP identified by top-down search. Within the v*P-phase, this ends up excluding the verb itself from p-stress assignment, since the top node of the phase (=VP) is ignored. However, the authors allow the verb to receive secondary "minor stress" optionally or to be incorporated into the adjacent prosodic domain formed by p-stress assignment to the object. They also introduce a constraint requiring the head of a prosodic constituent (=the item assigned primary p-stress) to align to the right edge of that constituent. In a head-final construction where the verb is assigned minor stress, this means that the head of the prosodic constituent is not right-aligned, in violation of the constraint. While these proposals do describe the facts adequately, they do not provide us with a truly explanatory account. The existence of optional subordination in the syntax/prosody of head-initial languages like English is not explained, only stated to be optional. Likewise, the suppression of stress after the p-stressed object in head-final constructions is not really explained here. The head-alignment constraint simply states that stress must be suppressed in this context.

The path I will pursue here begins with a specific theoretical assumption that is uncontroversial in the literature: after their initial merger, acategorial roots undergo some kind of movement for the purposes of categorization, placing them in a local relation with a categorizing element (n, v, etc.). In (49), this involves "head-movement" of to its categorizing element v. The same process presumably applies in the English nP, with movement of the root to a categorizer n.

(49)

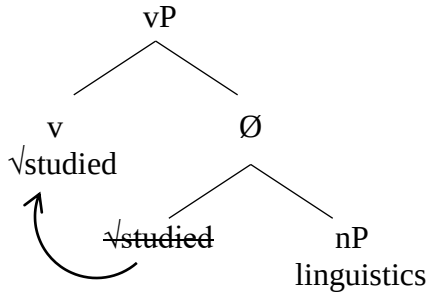


I follow up this basic assumption with an observation: movement of the root to v in a head-initial construction with a complement is string-vacuous (=50a), while √root-to-v movement in a head-final construction with a complement requires the root to move "over" the object non-string-vacuously (=50b).

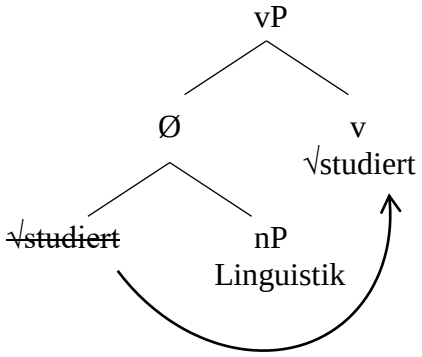
(50) a. She has [$_{vP}$ √studied$_{v}$ [$_{Ø}$ ~~√studied~~ linguistics]].

b. Sie hat [$_{vP}$ [$_{Ø}$ ~~√studiert~~ Linguistik] √studiert$_{v}$].

(51) a.



b.



As a consequence, in a head-final construction, the fact that the root is linearized rightward with v shows that it must have undergone head-movement to v.[24] In contrast, the English contexts do not clearly show that the root has moved to v in the surface form.

[24] This requires the assumption that the default spellout of the root in its base position is left of the object. There are two distinct options for justifying this assumption. First, we could appeal to specific linearization rules of German. Roots combined with complements occupy a structural configuration that is identical in many respects to the "specifier" position of X-Bar Theory. In German, specifiers are always linearized leftward, identical to English.

Second, we could appeal to deeper properties of parsing. From a Bare Phrase Structure perspective, the portion of the tree containing the lower instance of the root and its nominal complement (=[√Root NP]) consists minimally of a terminal node and a non-terminal node. In the absence of any specific linearization rule, natural languages do tend to prefer a parse of syntactic structure that is right-branching (see, e.g., Phillips (1995) for discussion). This would linearize the root leftward as the terminal element by default.

The root may have moved, or it may be spelled out in its lower position. The surface syntax doesn't clearly tell us. This basic difference between head-initial and head-final contexts in the application of head-movement forms the basis of the following expansion of the PSAR:

(52) **PSAR (expanded):** Phrasal stress is assigned to non-branching nodes.

(i) Terminal nodes projected by the LA are identified as branching nodes for p-stress assignment.

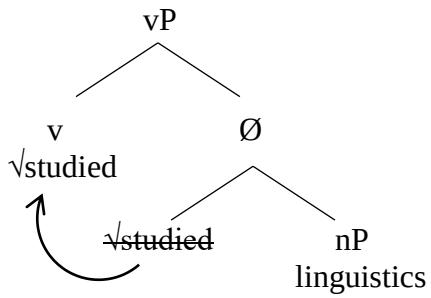
(ii) An ambiguous node X which undergoes head-movement to a node Y is identified with Y (X=Y) for p-stress assignment.

I define an ambiguous node as a node which occupies an ambiguous position in the syntactic representation. In other words, the node may or may not dominate other nodes due to the absence of a clear label on the node immediately dominating it: [$_{\emptyset}$ X YP]. The addition to the PSAR in (52) has the effect of preventing p-stress assignment to a root when it undergoes head-movement originating from an ambiguous position. In the context of German (=50b, 51b), the root is identified with v for the assignment of p-stress, meaning that it remains unstressed. This would also be the case in the English vP when the root moves to v (=50a, 51a). At first glance, this predicts that prosodic subordination should be obligatory in all contexts, but this is where the observations related to string-vacuity come into play. In a head-initial language where the linearization of the root and its category places the two adjacent to each other, I propose that no head-movement is needed for categorization. Instead, the root may be categorized by linear adjacency. This is very similar to a notion of "PF-Merger" invoked by, e.g., Bošković & Lasnik (2003) for the composition of affixes and their hosts: as long as two items are

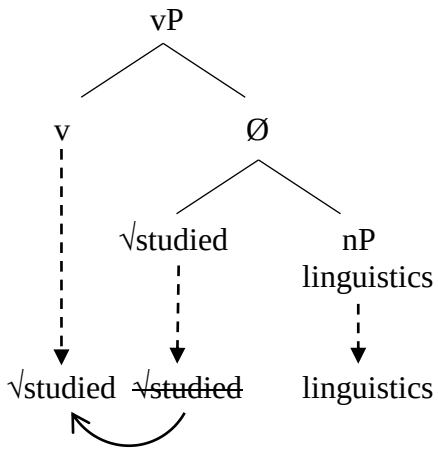
adjacent in the surface string, they may be directly composed postsyntactically.

(53) **Proposal:** Categorization of a root may be accomplished by adjacency at surface structure.

(54) a.

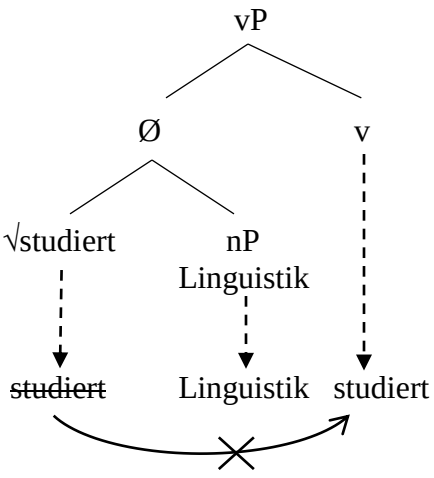


b.



No additional rules are needed to govern p-stress assignment in adjacency contexts. It suffices to say that p-stress assignment is optional in the base position of the root, since it occupies an ambiguous configuration. If the root does not show p-stress, this means that either (i) it was not assigned p-stress due to ambiguity, or (ii) the root has undergone head-movement (=54a). Crucially, however, in a head-final context like the German verb-final constructions, the only interpretation is that head-movement has applied (=ii), since categorization by linear adjacency is blocked by the object.

(55)



The fact that it is the *linear* intervention of the object which prevents composition of the root and v here is further proven by additional German data cited by Truckenbrodt (2012:4).

(56) **Q:** What happened to the hammer?

A: *Am Dienstag hat ihn ein Kunde ~~ihn~~ geklaut.*

on Tuesday has it a customer stolen

"On Tuesday a customer has stolen it."

(57) **Q:** What happened to the apparatus?]

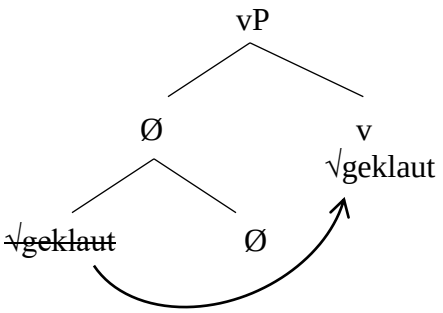
A: *In der Werkstadt haben ihn Fachleute ~~ihn~~ geölt.*

in the garage have it specialists oiled

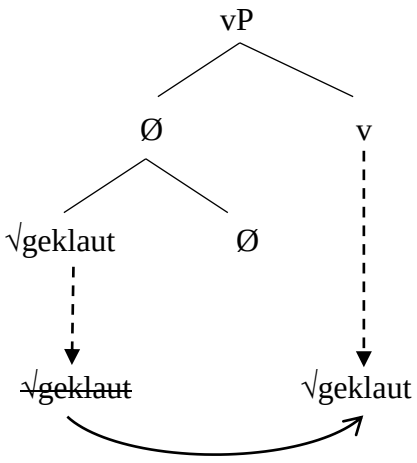
"Specialists have oiled it in the garage."

When the object is otherwise null, p-stress on the final verb becomes optional—mirroring English. This is captured by the account here, since, in the absence of the object, the root can compose with v either by head-movement or by adjacency, identical to the head-initial cases in English.

(58) a.



b.



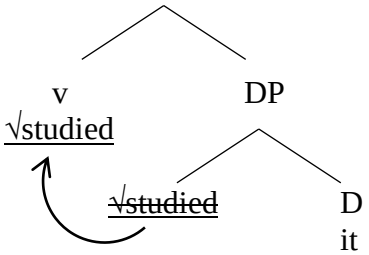
This optionality is not explained by Kratzer & Selkirk's (2007) account, which would predict that the verb should have obligatory primary p-stress in the absence of the object. An account in terms of Stress-XP also requires an array of additional stipulations to account for this optionality (see Truckenbrodt 2012 for proposals).

Finally, note that the modified PSAR neatly allows for the consistent patterns of p-stress assignment with pronominal objects in both head-initial and head-final contexts if we adopt the proposal in (45) whereby pronouns are analyzed as a category-type elements. This is illustrated in (59)-(60), where p-stress on the root is preserved regardless of the linearization of the head v which it moves to. This is because the root always originates from a non-ambiguous position in this case.

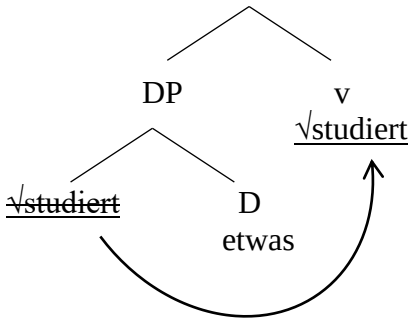
(59) a. She has [$_{vP}$ √studied$_{v}$ [$_{DP}$ ~~√studied~~ it$_{D}$]].

b. Sie hat [$_{vP}$ [$_{DP}$ ~~√studiert~~ etwas$_{D}$] √studiert$_{v}$].

(60) a.



b.



Although the focus of this section has been on head-final constructions with non-finite verbs, it should be noted that the principles proposed for p-stress assignment in relation to head-linearization, head-movement, and adjacency/PF-Merger also apply successfully to finite clause contexts in German where the finite verb moves to second position (typically C), unlike English, where the finite verb remains in the lower v-position. It is notable that, in such contexts, displacement-processes of object-shift and/or scrambling

frequently apply in order to place the object adjacent to the verb, shifting both verb and object around intervening items like the negative marker *nicht* and adverbials (*Sie studierte es **leider** **nicht*** "She **unfortunately** did **not** study it"). Both prosodic subordination and obligatory p-stress assignment apply in the same way. However, some contexts do exist where the verb and its object are split up, e.g., by a subject or adverbial. Unfortunately, the p-stress assignment properties of these sentences has not yet been studied in great detail, and so I leave it to future work to confirm these specific facts.

4.3.2 Intermediate Summary

So far, I have developed an account of prosodic subordination which covers contexts in which subordination is prohibited (=when a root combines directly with a category/pronoun), contexts where it is optional (=head-initial constructions where both head-movement and adjacency-composition are available), and contexts where it is obligatory (=head-final contexts where only head-movement is available). This is a near-comprehensive account of the facts for English and some related languages. However, thus far the focus has been exclusively on *local* prosodic subordination.

The next section discusses the phenomenon of *non-local* subordination, whereby subordination is licensed even though the licensing phrase has undergone movement away from its base position. I identify a specific constraint on non-local subordination where a p-stressed phrase intervening between the licensing phrase and a potentially prosodically subordinated word prevents subordination. I outline an account of this intervention effect in terms of higher level prosodic grouping (Major Phrase) and also extend it to the phenomena of final-pronoun constructions.

4.4 Constraints on Non-Local Prosodic Subordination

The sentences below review data on the licensing of non-local prosodic subordination from section 4.1:

(61) a. What subject did she study?

b. What did she study?

(62) a. I wonder what subject she studied.

b. I wonder what she studied.

(63) a. I researched a subject she studied.

b. I researched something she studied.

In each case, a phrasal unit has been displaced from its original postverbal position, but prosodic subordination is still licensed on the now sentence-final verb. This is significant in light of the proposal made in Chapter 3 with respect to the status of moved items for phonological rules. In particular, the following proposal (=78) was made:

(64) **Invisibility of Phonologically Null Terminals (IPNT):** Syntactic terminals that lack associated phonological material are ignored/invisible at the interface with prosody.

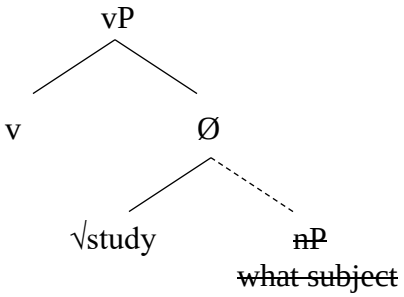
The first question to be addressed in this section is as follows: How can the IPNT be reconciled with the fact that, apparently, the assignment of p-stress is sensitive to the phonologically null base positions of moved items? If (64) is to be maintained, the broader set of environments in which prosodic subordination occurs must be examined, along with the consequences of (64) for the syntactic representation used by prosody.

The rule of prosodic word formation from Chapter 2 and the PSAR articulated in this chapter both target nodes which dominate no other nodes. If we apply the proposal in

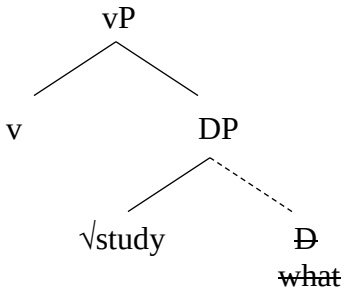
(64) and, in essence, eliminate from the representation branches which contain no phonological material, the result does not interfere with either of these rules, unless we view movement as actually trimming structure from the representation.

Thus, in (65) below, the complement-phrases have undergone movement, and their base copies are phonologically null. The system of prosody then ignores the branches above those copies (indicated by dashed lines). However, this does not alter any of the remaining structure above the now-null branches. In (65a), √*study* is still immediately dominated by an unlabeled node, while in (65b), √*study* is dominated by a labeled node.[25] Because of the way prosodic subordination has been defined, this allows for subordination to apply in (65a), since √*study* occupies an ambiguous position where it may or may not be subject to the PSAR, while subordination is prohibited in (65b) due to the label above √*study*.

(65) a.



b.



This demonstrates how prosody can ignore a phonologically null branch and yet preserve possibilities for prosodic subordination. Not that the same treatment carries over straightforwardly to unaccusatives, where the object undergoes movement to the subject position but still licenses subordination of the verb (=66).

[25] I assume here that labeling either applies before movement, or that it applies in such a way that movement does not necessarily prohibit the LA from taking the item undergoing movement into account. In other words, the moved item can be reconstructed to its base position for the purposes of labeling.

(66) a. My sister arrived.

b. She arrived.

Having shown how non-local prosodic subordination may be accommodated in the current system, let us now turn to the one major complication to the relatively simple picture of non-local subordination presented so far (which basically follows Bresnan 1971, 1972). Gussenhoven (1992:82, 84) and Truckenbrodt & Darcy (2010:18) observe that non-local prosodic subordination is only truly licensed if no additional p-stresses intervene between the moved phrase and the subordinated item. This amounts to a requirement that all material between a moved phrase and its point of origin must consist of unstressed functional material and/or obligatorily destressed (i.e. presuppositional, given) material. The sentences below illustrate:

(67) What subject did she study?

(68) a. What subject did your sister study?

b. *What subject did your sister study?

Whereas (67) is fine with or without p-stress on *study* under broad focus, in (68) the only allowable sentence under broad focus is (68a). (68b), with absence of p-stress on the verb, may only be interpreted with narrow focus on *sister*. In other words, the prosodic subordination of *study* under broad focus is no longer licensed by the moved phrase *what subject* when the p-stress-containing subject phrase *your sister* intervenes between the base and derived position of *what subject*. Gussenhoven (1984) also identifies this intervention effect in the case of unaccusative verbs when a stressed modifier intervenes between the subject and verb:

(69) a. My sister suddenly arrived.

b. *My sister suddenly arrived.

c. Speaking of surprises, my sister suddenly arrived!

(70) a. The vase mysteriously fell.

b. *The vase mysteriously fell.

c. Speaking of mysteries, the vase mysteriously fell.

The (c)-sentences indicate that when the intervening modifier is unstressed by its inclusion in the presupposition of the sentence, prosodic subordination becomes licensed again. Although this phenomenon has not yet been widely studied across many languages (see Truckenbrodt & Darcy (2010) for observations and experimental results for German; Gussenhoven (1992) for related data from Dutch), an account of this constraint on non-local prosodic subordination in English may shed light on other prosodic and syntactic effects. I offer two possible proposals below to account for the intervention effect and then extend the account to capture the seemingly very different phenomenon of "final pronoun constructions".

The first option is to focus on the role of linear adjacency in licensing prosodic subordination. Gussenhoven's (1983, 1992) "Sentence Accent Assignment Rule" is repeated below:

(27) **SAAR:** If focused, every predicate, argument, and modifier must be accented, with the exception of a predicate that, discounting unfocused constituents, is adjacent to an argument.

Under this rule, if a "predicate" (the typical candidate for subordination) is not adjacent to an argument, then it must show p-stress. Furthermore, because "unfocused

constituents" are ignored for the determination of adjacency, the SAAR provides a neat account of the intervention effect. In order to understand why precisely unfocused/unstressed items do not count for adjacency, I apply the stress-based algorithm for φ-phrasing presented in Chapter 2. Under this system, a new φ is created for each stressed syllable in a string, and all stressless items after the initial φ-boundary are incorporated leftward as enclitics. This means that a φ containing a p-stressed complement-phrases which licenses subordination will only be linearly adjacent to a φ containing a predicate/head if all items that occur in between are unstressed (i.e. functional items, pronouns) or destressed by presupposition/givenness. (71)-(72) show minimal pairs with stress-based φ-phrasing for sentences in (67)-(69). The (a)-sentences show cases where a φ intervenes between the φ containing the complement-phrase and the φ containing the head. In this configuration, prosodic subordination of the head is prevented. In contrast, the (b)-sentences show cases where both of the relevant φ are truly adjacent and prosodic subordination of the head is available.

(71) a. What (φ súbject did your) (φ síster) (φ stúdy)?

b. What (φ súbject did she) (φ stúdy)?

(72) a. My (φ síster) (φ súddenly) (φ arríved).

b. Speaking of surprises, my (φ síster suddenly) (φ arríved)!

It is worth asking how prosodic subordination of *study* and *arrived* in these sentences would affect φ-phrasing. Recall from Chapter 2 that, due to the stress-based nature of φ-phrasing assumed here, *relative* stress is an important factor. Thus far, I have assumed that simple w-stress is enough on its own to induce the creation of a φ, but the introduction of a greater degree of stress-prominence in the form p-stress or a pitch

accent could potentially result in φ-phrasing patterns where words that contain w-stress but do not receive p-stress are incorporated into other φ as if they were unstressed. In other words, the relative stress of a p-stressed item could supersede the normal φ-inducing status of a w-stressed item which does not receive p-stress.

One way to represent this distinction is to distinguish between prosodic units that are induced by w-stress and larger units induced by p-stress, essentially splitting the φ-category into two levels. This follows work by Selkirk (2000) and Kratzer & Selkirk (2007), which distinguishes at least two distinct intermediate prosodic levels: Major Phrase (MaP) and Minor Phrase. In particular, Kratzer & Selkirk (2007) associate MaP with the presence of a pitch accent ("major stress"), while MiP indicates secondary stresses (in the examples below, I will treat MiP and φ as interchangeable). Under the assumption that the presence of p-stress induces MaP-formation, (73) and (74) show Major Phrasing of (71) and (72), respectively.

(73) a. What ($_{MaP}$ subject did your) ($_{MaP}$ sister) ($_{MaP}$ study)?

b. What ($_{MaP}$ subject did she study)?

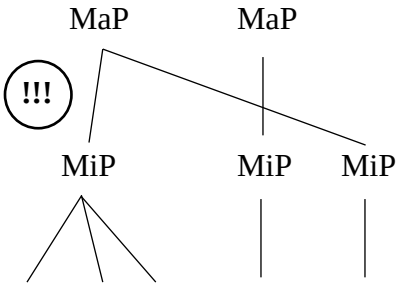
(74) a. My ($_{MaP}$ sister) ($_{MaP}$ suddenly) ($_{MaP}$ arrived).

b. Speaking of surprises, my ($_{MaP}$ síster suddenly arríved)!

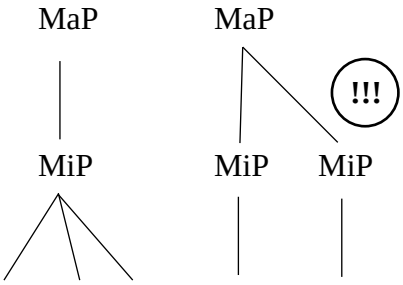
At this point, the special properties of (73b) and (74b) which license prosodic subordination become clear: Subordination may only occur if the subordinated head (*study, arrive*) and the subordinating complement (*subject, sister*) are organized into the same prosodic domain, i.e. the same MaP. I propose that this condition is reflective of the function of prosodic subordination as a means of preserving an underlying syntactic relation in the surface prosodic form: subordination of a word indicates that the word is

organized into a syntactic phrase with a local complement in the underlying form. Major Phrasing is constrained to reflect this fact by placing both the p-stressed item and the subordinated item in a single MaP. In (73a) and (74a), it is not possible to organize the subordinated word and the subordinating word into the same MaP due to the intervention of a distinct MaP formed by the subject or a modifier. Prosodic subordination in these sentences would result either in a prosodic structure that does not respect proper bracketing (=crossing branches in a hierarchical representation, as in (75a) below), or it would yield an incorrect interpretation where the verb is subordinated to the intervening phrase, as in (75b):

(75) a.

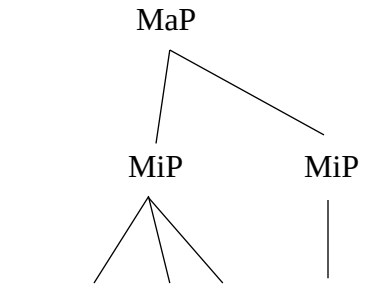


b.



The diagram in (76), on the other hand, shows that when no other p-stressed item intervenes to establish a MaP, the subordinated head can be incorporated straightforwardly into the same MaP as the subordinating word, reflecting the underlying syntactic relation.

(76)



To summarize, I have proposed here that the intervention effect which arises in the licensing of non-local prosodic subordination is due to a requirement that prosodic phrasing at the level of the Major Phrase (a constituent which is induced by p-stress and dominates φ) reflect the underlying syntactic phrasing which yields head+complement structures. In order for this to be accomplished, the individual φs/MiPs which contain the head and complement must be linearly adjacent to each other to prevent violations of improper bracketing/crossing branches (=75a) and/or the cuing of an incorrect interpretation (=75b). In essence, this proposal provides a more formalized account of Gussenhoven's SAAR, explaining the adjacency requirement as a reflex of higher-level prosodic organization.

At this point, I will apply the principles and constraints on the formation of MaP and MiP/φ to another set of a data: the phenomenon of "final pronoun constructions". These consist of a general degradation in the acceptability of certain sentence-types when those sentences end in an unstressed definite pronoun. The relevant cases include double-object constructions with ditransitive verbs (=77), particle+object constructions with phrasal verbs (=78), and resultative constructions (=79). In each case, a vP contains a direct object plus some other constituent (indirect object, particle, result-state, etc.), and the

linear ordering of these two elements is only acceptable if, when the direct object is pronominal, it is not vP-final, as shown in the (c)- and (d)-sentences below.

(77) a. I gave my sister a book.

b. I gave her a book.

c. I gave her it.

d. *I gave my sister it.

(78)[26] a. I turned the light on.

b. I turned on the light.

c. I turned it on.

d. *I turned on it.

(79) a. I hammered some metal flat.

b. I hammered flat some metal.

c. I hammered it flat.

d. *I hammered flat it.

The violation in the (d)-sentences cannot be a general constraint against vP/sentence-final definite pronouns, since such pronouns are fine in this position otherwise:

[26] The state of the phrasal verb data may actually be more complex than presented here. My impression is that the particle in a phrasal verb construction can be prosodically subordinated in the presence of a full phrasal object, regardless of its linear position. Thus, (78a-b) above may be revised as (78'a-b). (78c-d) are unchanged.

(78') a. I turned the light on.
b. I turned on the light.

Although we will not explore this further, I believe an account can be achieved with the assumption that particles may also be merged as bare root-type items in some contexts, rather than only embedded in PrtP. This may be a point of synchronic variation that deserves further exploration, since it can shed additional light on the underlying structure of phrasal verb constructions crosslinguistically.

(80) a. My sister studied **it**.

b. My sister traveled to **it**.

c. My sister was a fan of **it**.

Now, compare the violations in the (d)-sentences above with the violations in sentences repeated from the earlier discussion of non-local subordination.

(81) a. *What subject did your sister study?

b. *My sister suddenly arrived.

(82) a. *I gave my sister it.

b. *I turned on it.

c. *I hammered flat it.

In each case, the sentence ends with an unstressed word which is preceded by multiple other p-stressed words. One of the preceding p-stressed words bears a non-local syntactic relation to the unstressed word. This is straightforward in (81), as already discussed, since the phrases *what subject* and *my sister* clearly originate from local configurations with the subordinated verbs *study* and *arrive*, respectively. In (82), a syntactic relation is also established, but it is the inverse of the relation in (81): a relation between the unstressed direct object pronoun and the p-stressed selecting verb (*gave, turned, hammered*). Furthermore, the sentences in (82) cannot be ameliorated in the same way that the sentences in (81) can. Recall that if the subordinated verbs in (81) are assigned p-stress, as in (69a) and (70a) above, the sentences are fine. No such manipulation of p-stress is available for the final-pronoun construction in (82). Eliminating p-stress on the verb results in contrastive focus on the indirect object, particle, or resultative phrase (=83)

while adding p-stress to the direct object pronoun results in contrastive focus on the pronoun (=84).

(83) a. *I gave my sister it.

b. *I turned on it.

c. *I hammered flat it.

(84) a. *I gave my sister it.

b. *I turned on it.

c. *I hammered flat it.

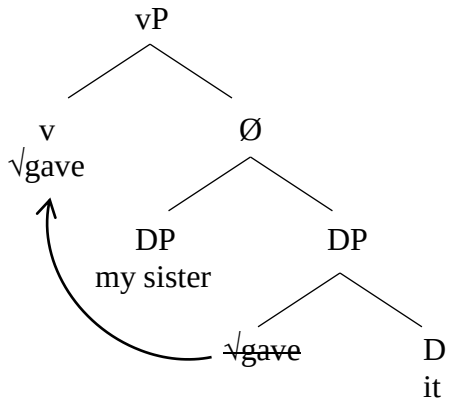
Thus, while both of these sentence-types show instances of non-local syntactic relations, they differ in the means by which that relation manifests with p-stress assignment: a verb may be optionally subordinated when it combines with a full phrasal object, but it cannot be subordinated when it combines with a pronoun.

With these facts established, I propose to account for final-pronoun constructions in the same way that constraints on non-local prosodic subordination were accounted for above: principles of MaP- and MiP/φ-formation. Briefly, recall that the account of p-stress assignment and local prosodic subordination in section 4.3 above incorporated the operation of "head-movement", whereby an acategorial root moves to a dominating category like v for categorization, as well as the assumption that pronominal elements are category-type items. In the context of the PSAR, this means that no ambiguity will exist in the syntactic relation between a pronoun and a root, and this is what yields the obligatory nature of p-stress assignment to the verb in (82) above. The relation between root and pronouns becomes a non-local relation upon the incorporation of an additional phrase, such as an indirect object (DP), particle (PrtP), or resultative adjective phrase

(AdjP) into the vP. This necessitates head-movement of the root around the additional phrase, creating a structure where the additional DP/PrtP/AdjP intervenes between pronoun and the head-moved root, as shown in (85)-(87):[27]

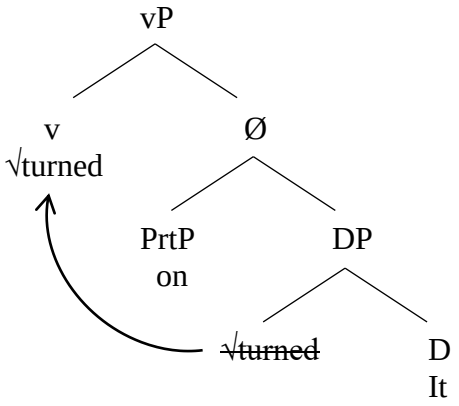
(85) a. *I [$_{vP}$ √gave$_{v}$ [[$_{DP}$ my sister] [$_{DP}$ ~~√gave~~ it$_{D}$]]

b.



(86) a. *I [$_{vP}$ √turned$_{v}$ [$_{Ø}$ [$_{PrtP}$ on] [$_{DP}$ ~~√turned~~ it$_{D}$]]

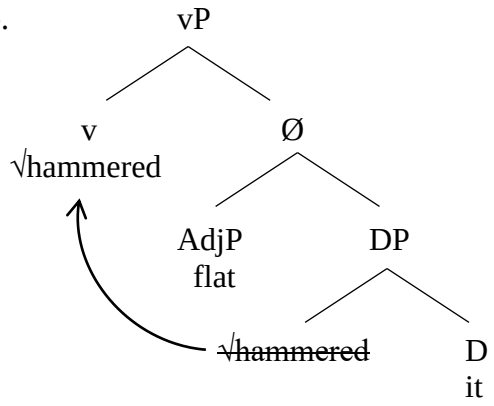
b.



[27] There may be differences between ditransitives, phrasal verbs, and resultatives that manifest in different structures for the vP, but I will not address these here. At minimum, I assume that each vP contains a lexicosemantic root which combines locally with the direct object constituent and then moves to v.

(87) a. *I [$_{vP}$ √hammered$_{v}$ [$_{Ø}$ [$_{AdjP}$ flat] [$_{DP}$ ~~√hammered~~ it$_{D}$]]

b.



With the application of head-movement in these structures, the parallel between final-pronoun constructions and non-local prosodic subordination becomes clear. Final-pronoun constructions involve head-movement of the root around an intervening DP/PrtP/AdjP within the vP, while non-local prosodic subordination structures involve phrasal movement of the complement around an intervening subject or modifier. In each case, an intervention effect arises that degrades the acceptability of the sentence: the moved item must be adjacent to the item it establishes a syntactic relation with in order for the PSAR to apply successfully.

Importantly, this account predicts that, just as with phrasal movement of the complement, the elimination of any p-stressed items between the verb and the pronoun should increase the acceptability of the sentences. This is certainly true for the ditransitive constructions (=88), but the facts for phrasal verbs (=89) and resultatives (=90) are less clear.

(88) a. I gave her it.

b. Speaking of my sister$_{i}$, I gave Susan$_{i}$ it.

(89) Did you flip on the light? - ?No, I turned on it.

(90) a. ?Seeing the doors were not open, I threw open them and went out.

b. *Seeing the metal was not flat, I hammered flat it and continued working.

In the case of phrasal verbs, the effect of contextual destressing of the particle is obscured due to the fact that particles like *on, off, over*, etc. are homophonous with true prepositions, which are typically unstressed. Thus, destressing the particle introduces an interfering factor which makes it difficult to assess whether or not the phrasal verb constructions are truly acceptable, but my judgement and the judgements of speakers I have consulted suggest that destressing of the particle does indeed ameliorate the final-pronoun construction if the right discourse environment is constructed.

As for resultatives, the ameloriative effect appears to be lexically conditioned. In (90a), I have provided an example with *throw open* which I judge to be generally acceptable. However, (90b) with *hammer flat* is extremely degraded. This may be explainable as a frequency-effect, given that even a cursory corpus search shows *throw open* as a more widespread construction than *hammer flat*, although a full corpus analysis would be needed to verify this. Alternately, the exceptional nature of resultatives could also be attributed to an underlying difference in the syntax of resultative constructions. Even so, given that final-pronoun constructions are pretty reliably ameliorated by destressing of the intervening phrase with ditransitives and phrasal verbs, I will leave the exact status of resultatives for future work.

With this said, I now extend the account of intervention in non-local prosodic subordination contexts to intervention in final-pronoun contexts. (91)-(93) show the assumed Major Phrasing of the relevant sentences.

(91) a. *I ($_{MaP}$ gave my) ($_{MaP}$ sister it).

b. I ($_{MaP}$ gave her it).

(92) a. *I ($_{MaP}$ turned) ($_{MaP}$ on it).

b. Did you flip on the light? – No, I ($_{MaP}$ turned on it).

(93) a. *I ($_{MaP}$ threw) ($_{MaP}$ open them).

b. Seeing the doors were not open, I ($_{MaP}$ threw open them) …

The (a)-sentences show deviant MaP-formation where the pronoun is incorporated into a MaP with a word that it does not bear a local syntactic relation to. The (b)-sentences serve as minimal pairs, demonstrating the impact of destressing, which allows the final pronoun to be placed in the same MaP as the verb it bears a syntactic relation to. A hierarchical representation of the phrasings in the (a)-sentences would mirror (75) above in that the unstressed pronoun could only be incorporated into a MaP with *gave*, *turned*, and/or *threw* by crossing branches. Otherwise, the pronoun is dominated by a MaP that does not also dominate the verb that it bears a syntactic relation to.

A final piece of data that remains to be discussed here involves the status of *indefinite* pronouns like *something* and *someone* and their role in the prosody/syntax mapping. Thus far, I have primarily relied on definite pronouns (*her, him, it*, etc.) in the examples. However, it is important to note that indefinite pronouns have the same properties as definite pronouns when it comes to the assignment of p-stress. They reject p-stress and do not license prosodic subordination of the word they combine with as complement.

(94) a. My sister studied something.

b. Someone arrived.

Based on these facts, it is tempting to conclude that indefinite pronouns fall into the same syntactic class as definite pronouns and should be characterized as category-type elements. This works fine for most cases. Crucially, however, when a final-pronoun construction contains an indefinite pronoun, it does not result in a violation, unlike the definite counterparts above.

(95) a. I gave my sister something.

b. I turned on something.

c. I hammered flat something.

In addition, when an indefinite pronoun serves as the postverbal argument of an unaccusative with *there*-insertion, it still results in unacceptability, but not to the same degree as a definite pronoun, cf. (96a-b).

(96) a. *There arrived it.

b. ??There arrived something.

Recall that the application of Major Phrasing requires that items which bear an underlying syntactic relation be organized into the same MaP. It is notable that while indefinite pronouns do not receive p-stress, they *do* contain w-stress, unlike definite pronouns, which are stressless. This observation for indefinite pronouns was used in section 4.1 as evidence that p-stress is not simply a deterministic extension of w-stress. In the context of final-pronoun constructions, the presence of w-stress on indefinite pronouns may provide the key to understanding why the expected violation is circumvented.

As discussed, sentences with non-local prosodic subordination and a final verb may be "repaired" by the assignment of p-stress to the verb. This leads to a prosodic form for the

sentence which is "neutral" with respect to underlying syntactic relations. In other words, the relation between the verb and its displaced complement is no longer reified by p-stress assignment. Instead, the verb and its complement both appear in their own MaPs. Final-pronoun constructions, on the other hand, are uniformly bad because no equivalent repair-strategy is available for them. The verb cannot be destressed, and the pronoun cannot be stressed, so a "neutral" prosodic form is unavailable. In the case of indefinite pronouns, however, just such a repair strategy may indeed be available due to the presence of w-stress. The inherent prominence of indefinite pronouns may allow the prosodic form of the sentence to be (just barely) construed as neutral, therefore avoiding any requirements placed on MaP-formation.

(97) a. I gave my sister **sómething**/a book.

b. I turned on **sómething**/a light.

c. I hammered flat **sómething**/some metal.

If w-stress can be construed as "prominence enough", then this results in a neutral prosodic form for the sentence; essentially, as if the indefinite pronoun were the equivalent of a full phrasal object. The fact that this is not quite enough to make the unaccusative construction in (96b) fully acceptable demonstrates that other factors are certainly at work, but still points us in the right direction when it comes to the contribution of prosodic constraints in the determination of acceptability for this structure. The precise details of the negotiation between w-stress, p-stress, principles of prosodic phrasing, and the underlying syntactic relations that may be reflected by prosodic form certainly deserve further exploration, but the discussion here suffices to illustrate some of the basic ideas for future research.

4.5 Conclusion

In this chapter, a variety of principles have been examined governing the assignment of phrasal stress/pitch accents to English sentences. I have identified one specific phenomenon—prosodic subordination—and developed an account within the framework of Bare Phrase Structure, Merge/Label, and root vs. category formatives to capture the relevant data. The account begins with the Phrasal Stress Assignment Rule (PSAR), which assigns p-stress to non-branching nodes in a syntactic representation. I then extend the analysis to pronouns, which are construed as non-root category-type elements with direct consequences for their integration into syntactic structure and their non-susceptibility to the PSAR. Next, the introduction of the process of head movement and root-categorization in syntactic structure allows for a direct account of differences between the prosody of head-initial (English-type) and head-final (German-type) languages in terms of the (non-)optionality of prosodic subordination, and the relevance of linear adjacency for categorization.

The last section of the chapter addresses the nature of non-local prosodic subordination, showing how it is possible to preserve the idea that prosody does not reference phonologically null syntactic structure within the current framework. After this, I identify a specific constraint on non-local subordination which manifests as the prevention of the licensing of non-local subordination when another p-stress-bearing phrase intervenes between the licensor and licensee. Through an examination of classic cases with sentence-final verbs and phrasal movement, I develop an account in terms of higher-level prosodic organization such that Major Phrase formation must reflect underlying syntactic relations, and then extend the account to “final-pronoun

constructions", which involve head-movement of the root around an intervening phrase. Ultimately, I believe the proposals made here provide a clearer picture both of general constraints on prosody/syntax-uniformity (i.e. isomorphic mappings) and applications for stress-based (i.e. non-isomorphic) approaches to prosodic phrasing which have broad applications in future work.

CHAPTER 5

THE PROSODY OF COMPLEMENTIZER EFFECTS

In this chapter, I examine the distribution of forms of the complementizer *that* in English; namely, variation between the full form *that* and the null form ("null-C"). In particular, I focus on capturing the distribution of null-C by applying principles of prosodic phrasing that are both stress-based (φ-phrasing) and syntax-based (ι-phrasing), ultimately showing that null-C is licensed in the same prosodic contexts in which other kinds of phonological reduction (lenition, segment-deletion) are licensed. Along the way, I examine the syntactic constructions in which null-C is not licensed (non-bridge verbs, clefting, right-node-raising, verb-gapping, etc.) in order to understand the interaction between prosodic and syntactic constraints. In addition, I develop accounts of other C-effects (the *that*-trace and anti-*that*-trace effects) that also shed new light on these classic phenomena and fit together with the central proposals for prosodic licensing.

5.1 Introduction

Constraints on the distribution of full, reduced, and null allomorphs of the English complementizer *that* have provided fodder for decades of linguistic research and theory, starting with Perlmutter (1968). The basic contribution of this chapter to this long line of work may be summarized as follows:

(1) The English complementizer *that* may be null in contexts where it is incorporated into a phonological domain to its left (i.e. as an enclitic).

This proposal has much in common with an earlier proposal for a suffixal null C-morpheme by Bošković & Lasnik (2003), although it arrives at the conclusion by a very different route. In particular, the proposal in (1) derives from the simple observation that

the reduced/null complementizer is licensed in exactly the same contexts in which word-initial phonological reduction of other functional categories in English (prepositions, auxiliaries, etc.) is licensed.

(2) a. She said **that** she studied linguistics. that/Ø

b. She went **to** a linguistics class. [tʰ]o/[ɾ]o

(3) a. **That** she studied linguistics was interesting. that/*Ø

b. Where did she go? – **To** a linguistics class. [tʰ]o/*[ɾ]o

The outcome of this proposal is that the licensing of "null-C" in English is determined at the level of phonology/prosody—not necessarily in the syntax. This being said, an analysis of C-effects in English is incomplete without a discussion of effects that arise in the context of syntactic movement/extraction; namely, the *that*-trace effect whereby null-C is obligatory when a subject undergoes long-distance extraction, and the anti-*that*-trace effect where null-C is prohibited when a subject undergoes short-distance extraction. Whatever the nature of the prosodic account articulated here, it should at minimum make the right predictions with respect to the availability of overt and null allomorphs of *that* in these additional contexts also.

Section 5.2 outlines the full range of data illustrating complementizer effects and discusses prior accounts of this data, focusing specifically on proposals that appeal to prosodic and phonological properties. Section 5.3 outlines the core proposal, reviewing phonological data from Chapters 2 and 3 and applying principles of phonological phrasing to account for general C-effects. Section 5.4 addresses the nature of the *that*-trace and anti-*that*-trace effects within this system, and outlines additional some

proposals with an eye toward a comprehensive account. Section 5.5 concludes the chapter.

5.2 Background on C-Effects

5.2.1 Basic Data[28]

The English complementizer *that*, which introduces dependent finite declarative clauses, may in certain contexts be phonologically null. These contexts are listed below. The first type of context (=4) is when the clause introduced by *that* is embedded as the complement of a specific subclass of verbs: verbs of speaking (*say, tell*), perception (*see, hear*), and belief (*believe, think*). The second context (=5) is when the clause is embedded as complement to adjectives specifying emotions, i.e. as the locus or cause of an emotional state (*happy, glad, sad, angry, worried, concerned,* etc.). The third context (=6) is in the context of object relative clause formation where a relative clause is formed on the basis of a nominal relativizing to the embedded object position.

(4) a. Sue **saw/heard** that/Ø Kurt had left.

b. Sue **told me/said** that/Ø Kurt had left.

c. Sue **believed/thought** that/Ø Kurt had left.

(5) Sue was **happy/glad/sad/angry/etc.** that/Ø Kurt had left.

(6) Sue ordered **a book** that/Ø Kurt had written.

In each case, the sentence remains acceptable regardless of the status of the complementizer. Importantly, the contexts in which a null complementizer ("null-C") is prohibited are far more varied and numerous. The basic dataset is listed below:

[28] The data in this section is adapted from a range of sources, including Postal (1974), Stowell (1981), Aoun, Hornstein, Lightfoot, & Weinberg (1987), Hornstein & Lightfoot (1991), Pesetsky (1992), Bošković & Lasnik (2003), and Bošković (2005), as well as my own native speaker judgements and those of other speakers I have consulted.

(7) a. Sue **whispered/murmured/screamed/etc.** that/*Ø Kurt had left.

b. Sue **liked/loved/hated/overjoyed/etc.** that/*Ø Kurt had left

c. Sue was **jealous/disgusted/annoyed/etc.** that/*Ø Kurt had left

d. Sue believed the **story/claim/report/rumor** that/*Ø Kurt had left.

(7a-c) illustrate classes of verbs and adjectives which fall outset the subsets specified for (4)-(5) above. These include verbs of utterance (7a), subject experiencer verbs (7b), and various other emotion-adjectives (7c). In addition, (7d) shows that when an embedded clause specifies the contents of abstract "container" nouns like *story*, *claim*, and *report*, it may not be null.

A few additional contexts clarify the nature of the constraints we are dealing with. In (8) below, null-C is prohibited when an embedded clause functions as a subject, while in (9), embedded clauses have undergone rightward extraposition away from a position local to the verbs, adjectives, and nouns that they relate to (indicated by a gap "__"). Crucially, null-C is prohibited under extraposition even when it is licensed in the base position (cf. (9a-c) with (4-6) above).

(8) **That/*Ø Kurt had left** annoyed Sue.

(9) a. Sue said __ yesterday **that/*Ø Kurt had left**.

b. Sue was happy __ yesterday **that/*Ø Kurt had left**.

c. Sue ordered a book __ yesterday **that/*Ø Kurt had written**.

(10)-(13) illustrate various other contexts in which an embedded clause is either displaced from a base position or targeted as part of a larger sentence-level transformation. In each case, the end-result is a prohibition on null-C:

(10) **It** annoyed Sue **that/*Ø Kurt had left.**

(11) a. Sue swore **that/*Ø Kurt had left.**

b. Sue swore to **it that/*Ø Kurt had left.**

(12) **That/*Ø Kurt left**, Sue didn't believe __.

(13) a. What Sue believed was **that/*Ø Kurt had left.**

b. Sue suspected, and we believed, **that/*Ø Kurt had left.**

c. Sue believed Moe arrived and Dan **that/*Ø Kurt had left.**

(10) and (11a-b) show another form of extraposition where the extraposed clause is coindexed with the pronoun *it*, which is inserted in the base position of the clause in lieu of a gap. *It-that* extraposition can occur from a subject position (cf. (10) with (8)) or an object position (=11), as shown. (12) demonstrates the effect of topicalization, while the sentences in (13) show constructions for *wh*-clefting (=13a), right node raising (=13b), and (verb-)gapping (13c). In each case, null-C is prohibited, and the clause introduced by *that* has undergone some kind of manipulation or displacement (see section 5.3 for further discussion).

Two other effects deserve discussion, both arising under different types of subject extraction. The first is termed the *that*-trace effect. It manifests as a requirement that C be null when the subject of an embedded clause has undergone long-distance movement:

(14) a. Who did you think ***that/Ø __ left?**

b. I met a man I thought ***that/Ø __ had left.**

The final effect is the inverse of the *that*-trace effect: the anti-*that*-trace effect, where null-C is prohibited when the subject of the embedded clause undergoes short-distance movement, as in short subject relative clauses. In the larger context of complementizer effects outlined here, we can see that the anti-*that*-trace effect is more or less in line with

the general prohibition on null-C, except that it is specifically tied to movement of the subject and does not arise with movement of the object for relative clause formation (see (6) above).

(15) **A package that/*Ø __ had just arrived** was unwrapped.

To summarize: null-C is licensed when it occurs in local combination with a specific subset of words (verbs, adjectives, nouns, etc.). In other contexts, when the embedded clause introduced by C occupies another position either through movement (extraposition) or the formation of some other construction (topicalization (pseudo)gapping, etc.), null-C is not licensed. In addition, when the subject of the embedded clause undergoes long-distance movement, null-C is not only licensed, but obligatory (=*that*-trace effect). When the subject only extracts short-distance, however, null-C is not licensed (=anti-*that*-trace effect).

5.2.2 Prior (Prosodic) Accounts

As an access-point into understanding complementizer effects ("C-effects") and the licensing of null-C, I begin with the account of Bošković & Lasnik (2003), which builds on proposals by Pesetsky (1992). The core idea articulated by these authors is that null-C is, in effect, a suffix which must attach to a local lexical head. Various constraints are then identified governing the attachment process. Pesetsky's originally proposes that C must undergo local head-movement to a higher V, with head-movement being blocked for various reasons in constructions where null-C is disallowed. Bošković & Lasnik (2003) outline an alternative to head-movement termed "PF Merger" whereby the relevant (null) suffix must be adjacent to its host in a string, and the contexts where null-C is prohibited involve various kinds of intervention (see Bošković 2005 for extensions

of this idea to the nominal domain. Bošković & Lasnik (2003) focus primarily on verbal constructions). The sentences in (16) illustrate the general idea, showing how null-C can be licensed by adjacency/locality to a verb (=16a) and not licensed when the embedded clause undergoes extraposition (=16b).

(16) a. Sue [$_{VP}$ said$_{V}$ [$_{CP}$ **-Ø**$_{C}$ Kurt had left]]

= Sue said-**Ø** Kurt had left.

b. *Sue [$_{VP}$ said$_{V}$ __ yesterday] [$_{CP}$ **-Ø**$_{C}$ Kurt had left]

= *Sue said yesterday-**Ø** Kurt had left.

Another important contribution is found in An (2006), who outlines a set of mapping principles that require the insertion of intonational phrase (ι) boundaries around clauses (=CPs). These principles are then combined with a ban on phonologically null edges of prosodic constituents. The presence of null-C at the leading boundary of an obligatorily-assigned intonation phrase domain leads to a violation of this constraint, and the difference between (16a) and (16b) above is attributed to the possibility of integrating two intonational phrases into a single intonational phrase when one clause is embedded inside another (=17a), an option which is not available under extraposition and in other constructions (=17b).

(17) a. ($_{ι}$ Sue said ($_{ι}$ **Ø** Kurt had left)) → ($_{ι}$ Sue said **Ø** Kurt had left)

b. *($_{ι}$ Sue said __ yesterday) ($_{ι}$ **Ø** Kurt had left)

Simplifying greatly, An's approach involves characterizing the non-licensing of null-C as a consequence of rules for the mapping between syntactic structure and prosodic structure that are both rigidly isomorphic (assigning prosodic boundaries in a deterministic manner based on syntactic boundaries) and explicitly sensitive to syntactic

structure that is devoid of phonological content. In other words, in order for null-C to create a violation in (17b), the prosody must be able to "see" the null morpheme and evaluate the fact that the phonological content within the embedded clause does not align to the edge of the isomorphically-assigned intonational phrase. This introduces a broader controversy in discussions of the relation between prosody and syntax: are null items visible to the system of prosody/phonology? We will return to this question shortly.

Overall, the proposal that will be made in section 5.3 is much more in the vein of Bošković & Lasnik (2003) than An (2006), and this is primarily due to the set of background assumptions that will be adopted to understand the mapping between syntax and prosody. An's framework is predicated on the notion that the mapping is primarily isomorphic, in line with the widespread thread of research evaluated in Chapter 2 (Selkirk (1996, 2011), Nespor & Vogel (1986), etc.). Following Chapter 3, I will adopt a comparatively weaker position on prosody-syntax isomorphy here, one that is informed by the full picture of phonological phenomena in English, in the vein of proposals by Lahiri & Plank (2010). In contrast to An's account, Bošković & Lasnik remain relatively neutral with respect to their understanding of prosody, since they characterize null-C in terms of morphological dependency (i.e. constraints on affixhood).

This means that the proposals made here will not necessarily unseat Bošković & Lasnik's proposals, since they still appeal to a form of dependency, but one that is prosodic in nature, rather than morphological; namely, the status of overt *that* as a prosodic enclitic). With this said, I believe that the proposal in section 5.3 better characterizes the nature of null-C licensing from a prosodic perspective in the larger context of phonological domain formation. This is an improvement overall because it ties

the constraints on null-C into broader principles of prosodic organization affecting all functional categories in English.

Interestingly, the small number of accounts mentioned thus far are unique in that they address the topic of C-effects in English very broadly, focusing on the general licensing principles for null-C in sentences like (4)-(6) before articulating more narrow proposals to target phenomena like the *that*-trace and anti-*that*-trace effects, if they address them at all. In contrast, there is a significant amount of literature which focuses almost exclusively on gap-based C-effects, without application to the simpler cases. Relevant to the account developed here are proposals that specifically target prosody as the locus of null-C licensing. Two major proposals have been made, one by Kandybowicz (2007) and the other by Sato & Dobaishi (2012). I will briefly summarize these frameworks in order to provide a snapshot of the character of proposals for capturing gap-based C-effects.

Kandybowicz (2007) builds on An's (2006) proposal that violations related to C-effects are related to constraints on the alignment of phonological material within prosodic domains which are formed based on syntax. Thus, whereas An postulates that null-C is prohibited when it falls at the left edge of an ι formed from a clause/CP, Kandybowicz postulates that there is another prosodic domain, the intermediate phrase (IntP), which is formed on the basis of TP internal to CP. A gap in the subject position of a sentence (=Spec-TP) would lead to a violation of the requirement that prosodic domains not have empty edges (=18a). Just as multiple ιs formed on recursively embedded clauses can be integrated together to license null-C (=17a), IntPs can also be integrated and eliminated when the ι dominating them is integrated/eliminated (=18b)

(18) a. *(ι Who did you think (ι that$_C$ ($_{IntP}$ **Ø$_{subj.}$** left)))

b. (ι Who did you think (ι **Ø**$_C$ ($_{IntP}$ **Ø$_{subj.}$** left)))

→ (ι Who did you think **Ø$_C$** **Ø$_{subj.}$** left)

Importantly, Kandybowicz's framework (and An's before it) is built on the assumption that null syntactic items like gaps/traces are visible to the system of prosody and are aligned within prosodic phrases in the same way that non-null items are. This is not an uncontroversial assumption, however, and it has been strongly argued against elsewhere (Nespor & Scorretti (1985), Sag & Fodor (1994), Zwicky & Pullum (1996)). In this same vein, Sato & Dobaishi (2012) develop an alternative account based on a different combination of principles for prosodic phrasing, and they explicitly distinguish their account from prior proposals by avoiding any appeal to null items/gaps/traces, viewing this as an advantage for their system.

Sato & Dobaishi (2012) adopt the assumption that function words are inherently incapable of forming phonological phrases on their own, echoing Selkirk's (1984:22) *Principle of Categorial Invisibility of Function Words*. Instead, function words are incorporated into other adjacent phonological phrases. In addition, the authors assume a rough correspondence between syntactic phrases and phonological phrases. The outcome of this is that the complementizer and subject of a clause are typically phrased together as a single unit (=19a-b). When the subject is null, as in subject-extraction contexts, this means that the complementizer (a function word) will be obligatorily parsed into a phonological phrase on its own, and this is where a violation arises (=20a). The solution is to select null-C and avoid phrasing the complementizer altogether (=20b):

(19) a. Sue thought **that Kurt** left

= … (thought) (**that Kurt**) (left)

b. Sue thought **Ø$_{C}$ Kurt** left

= … (thought) (**Kurt**) (left)

(20) a. *Who did you think **that Ø$_{subject}$** left?

= … (think) (**that**) (left)

b. Who did you think **Ø$_{C}$ Ø$_{subject}$** left?

= … (think) (left)

At first glance, it is unclear why *that* cannot be incorporated rightward into the domain formed on the verb *left* in cases like (20a). This is especially important, since Sato & Dobaishi elsewhere rely on the possibility of incorporating the complementizer into other phonological domains as a means of circumventing the *that*-trace effect, citing well-documented cases where a sentential adverb intervenes between *that* and the position of the subject (Bresnan 1977, Barss & Deprez 1986, Culicover 1993; Browning 1996). Examples in (21) are adapted from Kandybowicz (2007:222):

(21) a. Who did you think **that** after years of cheating death **Ø$_{subject}$** finally died?

= … (think) (**that** after years of cheating death) (finally died)

b. I met the author we thought **that** for all intents and purposes **Ø$_{subject}$** would be adored.

= … (thought) (**that** for all intents and purposes) (would be adored)

The authors point to observations by Hasegawa (2003:242) that some adverbs do not serve to ameliorate the *that*-trace effect, even when they follow *that* (=22), and they

postulate that this is because such adverbs typically follow the subject anyway (=23a), in contrast to the adverbs in (21), which precede the subject (=23b).

(22) a. *Who did she say **that just** escaped death?

b. *… the army that we know **that completely** destroyed the village.

(23) a. He **just/completely** escaped death.

b. **After years and years of cheating death**, Mary finally died.

Sato & Dobaishi do not note that their appeal to the specific syntactic position of adverbs in a sentence as a reference for where phonological phrases may or may not be formed essentially reintroduces the issue of whether or not the prosodic system is able to "see" phonologically null material. The authors explicitly claim that their account is superior to other accounts because they do not need to appeal to the nature of null gaps/traces. Even so, their explanation for why *that* is blocked from incorporating rightward into the phonological phrases containing the adverbs *just* and *completely* is dependent on the idea that the complementizer is "too far away" to be incorporated. This amounts to an implicit assumption that the system of prosody can "see" the syntactic structure containing the null subject which intervenes between *that* and the adverbs (=24a). When no null syntactic structure intervenes between *that* and the adverbial phrase (=24b), *that* incorporates rightward freely.

(24) a. *Who did she say **that Ø$_{\textbf{subject}}$** just escaped death?

b. Who did she say **that** after years and years of cheating death **Ø$_{\textbf{subject}}$** finally died?

This short comparison illustrates some of the larger issues at stake in any account of C-effects: Is prosody/phonology sensitive to null syntactic material? If so, can this be

reconciled with other phonological phenomena? If not, what specific constraints are at work to prevent the selection of null-C in specific syntactic and prosodic environments? In the next section, I will outline an account that is in line with the set of theoretical assumptions already articulated in Chapters 3 and 4. These include the assumption that prosodic and phonological rules need not directly reference null syntactic material, as well as the adoption of a partly non-isomorphic approach to the process of phonological phrasing (Lahiri & Plank 2010).

5.3 An Account of the Prosodic Licensing of Null-C

I begin by reviewing the approach to phonological phrasing outlined in Chapter 3. The underlying assumption is that, at the level of phrasing above the prosodic word, principles of rhythm, meter, and quantity that come into play during the process of language production become relevant for the insertion of phonological boundaries and supersede boundaries that would otherwise be inserted based on underlying syntactic boundaries. The outcome of this system is that phonological phrasing in English is first and foremost viewed as a function of stress-prominence, which guides the parsing of words and syllables into rhythmic domains. As shown in (25), each phonological phrase (φ) is initiated by a stressed syllable and incorporates any following unstressed syllables up until the start of the next domain.

(25) **Susan has hopped a bus to Tucson.**

= ($_{\varphi}$ Súsan has) ($_{\varphi}$ hópped a) ($_{\varphi}$ bús to) ($_{\varphi}$ Túcson)

I adopt this view from proposals by Lahiri & Plank (2010), who cite synchronic, diachronic, and experimental data to support the non-isomorphic approach to prosody/syntax. In particular, there is good evidence that, in Germanic languages,

function words (verbal auxiliaries, determiners, prepositions, etc.) should be treated as *enclitics*, prosodically dependent on what precedes them in a phonological string. This goes against the general assumption in much prosody/syntax work that function words in English are *proclitic*, associating rightward into the phrase they combine with syntactically.

Importantly, even under this set of assumptions, there is one way in which syntactic units tend to match up with prosodic units by indirect means. Lahiri & Plank locate this relation at the level of the clause/sentence, as "major planning units" (2010:374), and indeed the starting point for any utterance in general will by definition show an isomorphic match-up between syntactic boundaries (the opening bracket of a syntactic phrase) and prosodic boundaries (the opening boundary of an utterance). Previously, we have not focused on this level of organization, but the area of C-effects affords us an opportunity to explore the interaction of both "major planning units" and phonological phrase formation in the context of constraints affecting the complementizer *that* (=a function word) or its null counterpart.

The sentences below repeat data from Chapter 2 on the application of phonological rules which target word-initial segments of function words. These include lenition or flapping of voiceless stops (=26) and word-initial segment-deletion (=27). In each case, the phonological rule is allowed when the function word is internal to a phonological phrase (=(a)-sentences), but disallowed when the function word is aligned to the leading

edge of a prosodic boundary, whether we understand this initial boundary to be that of an intonation phrase (as in the (b)-sentences) or an utterance (as in the (c)-sentences).[29]

(26) a. Susan drove **[ɾ]o** Tucson.

= (υ (ι (φ Súsan) (φ dróve **to**) (φ Túcson)))

b. I will drive, Susan said, **[t^{h}]o** Tucson

= (υ … (ι (φ Súsan) (φ sáid)) (ι **to** (φ Túcson)))

c. Where did Susan drive? – **[t^{h}]o** Tucson

= (υ **to** (φ Túcson))

(27) a. Susan **has [æz]** visited.

= (υ (ι (φ Súsan **has**) (φ vísited)))

b. Susan, Mary claimed, **has [hæz]** visited.

= (υ … (ι (φ Máry) (φ cláimed)) (ι **has** (φ vísited)))

c. Has **[hæz]** Susan visited?

= (υ **Has** (φ Súsan) (φ vísited))

The primary claim advanced here is that the complementizer *that* in English is no different from other functional categories. In certain prosodic environments, it is reducible (yielding null-C), while in other environments it is non-reducible. I have already discussed how prior frameworks are split in terms of how they address whether or not null material is visible to the prosodic system. It will be shown that, if the licensing of null-C is understood to be an issue of licensing phonological reduction, the question of the visibility of null content is actually beside the point. The distribution of *that* vs. null-

[29] In the discussion that follows, I use intonation phrase (ι) as a catch-all term. What matters is that phonological reduction applying to function words is prohibited at the initial boundary of some domain: whether that is at the beginning of an utterance, intonation phrase, or phonological phrase.

C lines up with the general (un)availability of phonological reduction for function words. Thus, if we apply the basic principles of phonological phrasing to sentences like those in (4) and (5), where a clause is embedded after a verb, adjective (as a complement), or noun (as an object relative clause), barring some other influencing factor, the complementizer *that* will simply be incorporated as an enclitic into the φ that precedes it. In these specific contexts, null-C also happens to be licensed, just as phonological reduction is licensed on other function words in these environments.

(28) a. (φ Súe) (φ sáw **that/Ø**) (φ Kúrt had) (φ léft)

b. (φ Súe was) (φ háppy **that/Ø**) (φ Kúrt had) (φ left)

c. (φ Súe) (φ órdered a) (φ bóok **that/Ø**) (φ Kúrt had) (φ written)

These sentences can immediately be contrasted with sentences where extraposition has occurred and the embedded clause has been displaced to the right, leaving either a gap (=29) or an expletive pronoun *it* (=30). In these contexts, it has been regularly observed that both the main and embedded clauses are obligatorily parsed as separate intonation phrases (Cooper and Paccia-Cooper 1980, Selkirk 1978, 1984, 1986, Nespor and Vogel 1986, Schütze 1994, Bošković 2001; An 2004, 2006).

(29) a. (ι Sue said yesterday) (ι **that/*Ø** Kurt had left)

b. (ι Sue was happy yesterday) (ι **that/*Ø** Kurt had left)

c. (ι Sue ordered a book yesterday) (ι **that/*Ø** Kurt had written)

(30) a. (ι It annoyed Sue) (ι **that/*Ø** Kurt had left)

b. (ι Sue liked it) (ι **that/*Ø** Kurt had left)

c. (ι Sue swore to it) (ι **that/*Ø** Kurt had left)

I postpone the question of why ɪ-boundaries are inserted in this way momentarily. For now, it suffices that the facts on ɪ-insertion fit straightforwardly with the approach to the licensing of null-C put forward here: if extraposition results in the obligatory insertion of an ɪ-boundary before the embedded clause, this will preclude the possibility of integrating *that* into the main clause as an enclitic. Instead, C is forcibly aligned to the leading edge of an ɪ in these contexts, and null-C is prohibited. This essentially means (uncontroversially, I believe) that the process of ɪ-boundary insertion which applies in the context of extraposition supersedes or overrides the process of phonological phrasing that would otherwise apply, leading to an isomorphic match-up between ɪs and the syntactic equivalent of a clause when that clause is extraposed.

At this point, I will pause to evaluate the full range of data that it is necessary to capture. Importantly, the number of contexts in which null-C is *not* licensed dramatically outnumber the contexts where null-C is licensed. An understanding of the non-licensing of null-C should take this into account, and understanding how prosodic boundaries like those of ɪ are inserted or neutralized is crucial to this task. To begin, it appears that the insertion of ɪ-boundaries around syntactic units roughly corresponding to clauses/CPs is the default case. Thus, Selkirk (1978) observes that ɪ-boundaries are also inserted around sentential subjects, which are not extraposed (=31a). Within the framework assumed here, this means that null-C will be always be prohibited within sentential subjects, since C will always align to the leading edge of an ɪ-boundary. Essentially the same analysis goes for topicalization of an embedded clause (=31b), since topicalized clauses are also parsed as independent ɪs, even when they originate from a complement position.

(31) a. (ι (ι **That/*Ø** Kurt had left) annoyed Sue)

b. (ι **That/*Ø** Kurt left) (ι Sue didn't believe)

If ι-boundaries are obligatorily inserted around clauses generally, what makes the contexts in (28) special? A first pass at answering this question is to attribute the exceptional properties of (28) to the syntactic configuration of the clause. Thus, the embedded clauses in (28a-c) all roughly fall into the structural position of "complement", such that, in the syntax, the embedded CP is directly combined with (=sister to) the category that precedes it, being generally interpreted as the internal argument of a predicate. In these contexts, an ι-boundary is not obligatorily inserted before the embedded clause. This property of English prosody has been regularly noted in the literature on intonational phrasing, going back to Emonds (1970) and Downing (1970), Downing (2011); see also Selkirk (1978, 1984, 2005, 2011), Nespor and Vogel (1986), Ladd 1986, 1996, etc.). Downing (1970:30) in particular characterizes the insertion of ιs in terms of root vs. embedded clauses, with ι-boundaries being primarily inserted around root clauses/CPs, as illustrated in (32b). Another approach is presented by Truckenbrodt (2005) whereby a rightmost ι-boundary is assigned to each individual CP. When one CP is embedded inside another, their rightmost ι-boundaries simply match up, and no leftmost ι-boundary will intervene between the main and embedded clauses (=32c).

(32) a. [$_{CP=ROOT}$ Sue said [$_{CP=EMBEDDED}$ that/Ø Kurt had left]]

b. (ι ι)

c. ι) ι)

Whichever approach is adopted, the generalization is the same: ι-boundaries assigned to a clause may be neutralized when that clause is embedded as a complement internal to

another clause, and when such neutralization or integration occurs, null-C is licensed because of the removal of the obligatory boundary preceding C.[30] All of this roughly follows the reasoning of Bošković & Lasnik (2003): something about the lexical or prosodic context preceding C may end up blocking the formation of a leftward dependency, resulting in a violation of some kind. Bošković & Lasnik locate the violation in the morphological properties of null-C: null-C is a suffix which must attach to a host at surface structure. The present account attributes the violation to the origin of null-C itself. Rather than assigning special morphological properties to a null morpheme, I assume that null-C is actually a reduced allomorph of *that*, paralleling examples of variation between reduced vs. full forms of other function words (cf. [t^{h}]o vs. [ɾ]o, [hæz] vs. [æz], etc. above). This simultaneously avoids distinguishing *that* from null-C in terms of its morphological specifications (i.e. why is it that *that* appears to be a free morpheme, while null-C is a suffix?) and places C-effects within the larger realm of phonological processes that target function words.

The status of null-C as a reduction of the full form *that* on a scale similar to reductions of other function words is further evidenced by the fact that the overt form of the complementizer can be subject to word-initial segment-deletion, discussed at length in Chapter 2 (drawing upon judgements by Zwicky (1970)). My own judgements and those of speakers I have consulted are such that, simply put, *that* may undergo word-initial segment deletion, in this case targeting [ð] to yield [æt] or [ət], in precisely the same

[30] To be clear, the availability of this process of ɪ-integration is not necessarily universal. While it has been observed for languages like German (Truckenbrodt 2015), Swedish (Myrberg 2010, 2013), Turkish (Kan 2009), Catalan (Feldhausen 2010), Xhosa (Jokweni 1995), Hungarian, and Bàsàá (Hamlaoui & Szendrői 2017), certain other languages appear to assign ɪ-boundaries to all CPs regardless of their embedded status (see Ishihara (2014) for Japanese, Pak (2008) for Luganda).

contexts where it may also be null, and the same process is arrested in contexts where null-C is prohibited. In Chapter 2, the licensing of phonological reduction processes like word-initial deletion was taken as a cue for the absence of a strong prosodic boundary. As will be demonstrated, I assume the same is true here: *that* may be reduced—even fully deleted—when it is not aligned to an initial prosodic boundary.

With this said, I turn now to some more challenging cases not covered by Bošković & Lasnik. First, consider the fact that not all verbs, adjectives, and/or nouns license null-C in a following embedded clause. Thus, verbs of utterance, subject experiencer verbs, various other adjectives, and many nouns do not license null-C. The relevant sentences from (7) are repeated below.

(7) a. Sue whispered/murmured/screamed/etc. **that/*Ø** Kurt had left.

b. Sue liked/loved/hated/enjoyed/etc. **that/*Ø** Kurt had left

c. Sue was jealous/disgusted/annoyed/etc. **that/*Ø** Kurt had left

d. Sue believed the story/claim/report/rumor **that/*Ø** Kurt had left.

The prosody of such constructions has not been clearly addressed, perhaps with the exception of Franks (2000, 2005), who focuses on the case of verbs. Franks (2005:18-19) cites the following prosodic judgments, which I generally agree with and have been confirmed to me by other speakers. In sentences with verbs like those in (7a), an intonational break or pause (="#") indicating an IP-boundary may precede, but not follow, the C of the embedded clause (=33a). In contrast, a similar break may optionally precede or follow the C of an embedded clause with a verb like *say, think,* etc (=33b).

(33) a. Bill quipped {#} that *{#} he saw a ghost.

b. Bill said {#} that {#} he saw a ghost.

In the context of the framework assuming widespread enclisis of function words, these judgments fit well with our understanding of how null-C is prosodically licensed. When *that* may encliticize into the preceding phonological domain (indicated by the acceptability of a prosodic break after *that*), it may also be null. Crucially, something about the environment of (33b) prevents enclisis of *that* (indicated by the unacceptability of a break after *that*), only allowing it to incorporate forward into the clause it heads, and thereby prohibiting null-C.[31]

It is important to add that various syntactic and semantic contrasts have also been identified in relation to the different verb-classes represented in (33). Foremost among these properties is that fact that syntactic extraction of a phrase from within the embedded clause is generally fully acceptable after verbs like *say* or *think*, but is less acceptable after verbs like *whisper* or *quip*. The terms "bridge verb" and "non-bridge verb" have been used to describe this difference in the availability of extraction, and the consensus of research is that the embedded clause in each case has a different syntactic status: complement in the case of a bridge verb (=34a) and adjunct or modifier in the case of a non-bridge verb (=34b). The adjunct-status of the embedded clause in (34b) places it in the class of "island" constituents which generally resist extraction (see Doherty (1993) for further discussion and examples).

(34) a. Who did Sue say [$_{CP}$ that she met ~~who~~]? bridge verb

b. ??Who did Sue quip [$_{CP}$ that she met ~~who~~]? non-bridge verb

[31] My impression is that the presence vs. absence of an ι-break also correlates consistently with the presence vs. absence of phrasal stress on the verb. Phrasal stress may be absent on *said* in (33b), whereas it is generally obligatory on *quipped* in (33a). This accords with the tendency in English for verbs combining with structural complements to undergo "prosodic subordination", as discussed in Chapter 4, and provides further evidence that the embedded clause occupies a complement position in (33b), but does not in (33a).

We also find similar restrictions on extraction with adjectives and nouns that pattern with non-bridge verbs in terms of prohibiting null-C, and the adjunct-analysis of embedded clauses can be easily extended to these contexts.

(35) a. ??Who was Sue annoyed [$_{CP}$ that Kurt met ~~who~~]? non-bridge adjective

d. ??Who did Sue believe the story [$_{CP}$ that Kurt met ~~who~~]? non-bridge noun[32]

Focusing again on verbs, semantic and discourse properties are also relevant. In each case in (34), the embedded clause conveys some information relevant to the interpretation of the embedding verb, and it is not clear on the surface what the difference is, since both embedded clauses seem to convey the informational content of the verb (i.e. what was said, what was murmured, etc.). If, however, another sentence is added with a pronoun referring back to some item of the first sentence, as in (36), there are different interpretational preferences for the indexing of the pronoun. In (36a), *it* refers to the content of the embedded clause, i.e. Kurt's leaving is what was terrible. In (36b), on the other hand, *it* tends to refer to the content of *murmur* itself, i.e. Sue's murmuring is what was terrible, not necessarily Kurt's leaving.

(36) a. Sue said that Kurt had left. It was terrible.

b. Sue murmured that Kurt had left. It was terrible.

This parallels a straightforward difference in discourse structure that Irwin (2016) observes between transitive verbs and unergative verbs. (37a) illustrates that when a transitive verb introduces its object as a discourse referent, *it* in a following sentence prefers to index with that object, while in (37b) *it* prefers to index with the content of the unergative verb itself.

[32] This is typically (though ironically) labeled as an "NP-Complement" construction.

(37) a. I saw a unicorn$_i$. It$_i$ was beautiful.

b. A unicorn danced$_i$. It$_i$ was beautiful.

To summarize, the insertion of ι-boundaries around CPs is sensitive to the syntactic status of those CPs. When a CP is embedded as the complement of a verb, adjective, or noun, ι-boundaries may be neutralized if the CP is not extraposed, and null-C is licensed. In contrast, when a CP is embedded as an adjunct or modifier after a verb, adjective, or noun, ι-boundaries are preferred, and null-C is prohibited. The complement- vs. adjunct-status of CPs in these "bridge" and "non-bridge" contexts is strongly supported by additional syntactic and semantic factors.

Let us turn now to the set of facts in (13), repeated below. These encompass a variety of constructions where complement clauses are subject to further operations resulting in non-licensing of null-C. (13a) is an example of "*wh*-clefting", (13b) an example of "right-node-raising", and (13c) an instance of "(verb-)gapping". While these constructions may appear to be heterogenous on the surface, closer examination shows how they fit into the overall prosodic picture.

(13) a. What Sue believed was **that/*Ø Kurt had left.** pseudocleft

b. Sue suspected, and we believed, **that/*Ø Kurt had left.** RNR

c. Sue believed Moe arrived and Dan **that/*Ø Kurt had left.** gapping

I begin by discussing the case of *wh*-clefting, where an embedded clause is equated with a *wh*-phrase in a root clause with *be*. At the outset, it should be noted that the prohibition on null-C in the context of a *wh*-cleft is not actually specific to clefting itself, but is instead a common property of sentences consisting of the pattern DP + *be* + *that*-CP, as shown below:

(38) a. The problem/issue/etc. is **that/*Ø** Kurt has left.

b. My fear/belief/concern/worry/etc. is **that/*Ø** Kurt will leave.

Furthermore, *wh*-clefts are only one of a class of cleft-sentences in English, with interrelated properties. Thus, for each sentence in (38), two other related sentences are possible, one where the CP itself is promoted to subject position (=39a-40a) and one where an expletive pronoun *it* is inserted in the subject position and both the DP and the CP remain postverbal (39b-40b). This is typically called an "*it*-cleft".

(39) a. That Kurt has left is the problem/issue/etc. sentential subject

b. It is a problem/issue/etc. that Kurt has left. *it*-cleft

(40) a. That Kurt will leave is my fear/belief/concern/worry/etc. sentential subject

b. It is my fear/belief/concern/worry/etc. that Kurt will leave. *it*-cleft

I conclude from the facts in the (b)-sentences above that each sentence-type (non-cleft, *it*-cleft, sentential subject) originates from a common base. More specifically, the underlying structural relation between the DP and the CP in these sentences may be characterized as a "small clause", represented schematically in (41).

(41) **… *be* [SC DP CP]**

= [[$_{DP}$ The problem] is [$_{SC}$ [$_{NP}$ ~~the problem~~] [$_{CP}$ that Kurt has left]]]

Applying our understanding of ι-boundary insertion to this structure, we can see that, because the relation between the DP and CP is not the equivalent of a head combining with a complement, integration of the ι assigned to the CP (and, hence, licensing of null-C) will never be available. In (38), the CP is not technically the structural complement of *be*.[33] In (39a-40a), the CP occupies the subject position and so C will always align with

[33] This is further evidenced by the fact that *be* cannot undergo vowel reduction/deletion, which would otherwise indicate that it bears a head-relation to the phrase that follows it. In essence, *be* is prevented from

an ι-boundary anyway, while in (39b-40b), the CP is again not the complement of the DP, due to the underlying Small Clause. We can see that the CP in these constructions is treated essentially as if it were an adjunct in a non-bridge context, just as in (7), and this is confirmed by extraction-tests. (42) and (43) show that extraction from the CP is degraded in all contexts.

(42) a. *Who is the problem/issue/etc. **that/*Ø** Kurt has met ~~who~~?

b. *Who is your fear/belief/concern/worry/etc. **that/*Ø** Kurt will meet ~~who~~?

(43) a. *Who is it a problem/issue/etc. that Kurt has met ~~who~~?

b. *Who is it your fear/belief/concern/worry/etc. that Kurt will meet ~~who~~?

Returning to the specific case of *wh*-clefting, we can apply essentially the same analysis to the underlying structure, understanding the CP to be a modifier of the *wh*-item which is fronted to the subject position. This accounts for the unavailability of null-C is this context.

(44) **… *be* [SC WH CP]**

= [[$_{WH}$ What Sue believed] was [$_{SC}$ [$_{WH}$ ~~what Sue believed~~] [$_{CP}$ that Kurt had left]]]

At this point, I have attributed the non-licensing of null-C to the syntactic environment of CPs headed by *that*. CPs in non-bridge (=non-complement) contexts are not able to undergo ι-integration, and so an ι-boundary always ends up preceding C.

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reducing because it is followed by a gap of some kind (the item extracted from the SC). See discussion of this process in Chapter 2 (Section 2.3.1).

(i) a. The problem **is/*-'s** that Kurt has left.
b. That Kurt has left **is/*-'s** the problem.

(ii) a. My fear **is/*-'s** that Kurt will leave.
b. That Kurt will leave **is/*-'s _** my fear.

We turn now to the case of right-node-raising (RNR) represented in (13b) above, where an embedded CP is placed in a construction with two coordinated clause-taking verbs. The CP clearly counts as complement for both verbs, and yet null-C is not licensed. The prosodic facts for RNR sentences are relatively well-established in the literature. Selkirk (2002) finds that speakers prefer a clear prosodic break following each of the coordinated verbs, which are themselves pronounced with strong H-tone pitch accents indicating narrow focus (see also Hartmann (2000), Féry & Hartmann (2005), Ha 2008). In addition, Abbot (1976) and Swingle (1993) both note early on that RNR constructions actually require that both of the conjuncts and the element that is displaced rightward (the "pivot"; CP, in this case) must all be parsed into separate ɩs. These facts are represented in (45) below.

(45) ($_ɩ$ Sue suspected^{H*}) ($_ɩ$ and we believed^{H*}) ($_ɩ$ that Kurt had left)

Despite its obligatory prosodic independence, the status of the CP as a syntactic complement of the coordinated verbs is confirmed by the fact that extraction from the CP is perfectly acceptable:

(46) Who did Sue suspect, and we believe, [$_{CP}$ that Kurt had met ~~who~~]?

This means that, although something about the derivation of RNR must bar ɩ-integration, we cannot simply appeal to the syntactic status of the CP itself: it is clearly in a complement-relation with the coordinated verbs that precede it, but this does not seem to be enough to license the usual integration.

To understand why, it is necessary to grapple with some additional constraints that are present in RNR. Importantly, there is a principle of parallelism at work in the licensing of the conjuncts in relation to the pivot-CP: the CP must bear an identical structural relation

to both of the coordinated verbs; i.e., the two conjuncts must be structurally parallel. To illustrate, note that it is not possible to coordinate a non-bridge with a bridge verb in an RNR-construction (=47a), even though it is certainly possible if RNR is avoided by expressing the full clause in both conjuncts (=47b).

(47) a. *Sue quipped, and we believed, that Kurt had left.

b. Sue quipped that Kurt had met Moe, and we believed that Kurt had met Moe.

With this in mind, if ι-integration correlates with complement-status of the CP, this means that if the CP were prosodically-integrated into one conjunct, but not the other, it would result in a violation of parallelism. Because of the linearly-constrained nature of the RNR-construction, it is not possible to apply ι-integration to both conjuncts at once, since the second conjunct intervenes between the first conjunct and the CP. The best we can do is to integrate the ι of the embedded CP into the ι of the clause that immediately precedes it (=48b), but, once again, this violates the requirement of parallelism, since it indicates that the CP is complement to *believed*, but not to *suspected*.

(48) a. (ι Sue suspected) (ι and we believed) (ι that Kurt had left)

b. *(ι Sue suspected) (ι and we believed that Kurt had left)

The upshot of this discussion is that null-C can also be prohibited when certain other principles, like the parallelism requirement that manifests for coordinate structures in RNR, affect the possibilities for prosodic integration of ιs. This leads to the final construction that will be dealt with here: the instance of verb-gapping in (13c). In this case, two clauses are coordinated and the outcome is that the verb of the second conjunct undergoes ellipsis under identification with the verb of the first conjunct (Johnson, 1997; Kuno, 1976; Sag, 1980). Parallelism is still relevant here, since the object in both clauses

must be compatible with both the overt and the deleted verb. I represent ellipsis with a strikethrough below.

(49) Sue believed [$_{CP}$ that Moe arrived] and Dan ~~believed~~ [$_{CP}$ that Kurt had left]

The approach to this construction is relatively simple. It has already been established that, in order for ι-integration to proceed, a CP must be parsed as the complement of an adjacent word/category—in this case, a verb. However, since the verb in the second conjunct undergoes ellipsis, it is no longer a part of the surface structure of the sentence. Instead, the sentence simply consists of the subject (the NP *Dan*) immediately followed by the CP. This parallels non-bridge contexts where a CP is parsed adjacent to a word/phrase which does not take the CP as a complement, and where, therefore, ι-integration is disallowed. Notably, however, even though this looks like a non-bridge context on the surface, underlyingly this is not the case, since extraction from the CP is licit as long as the parallelism-requirement between the conjuncts is maintained (in this case, by employing "Across-the-Board" movement):

(50) Who did Sue believe [$_{CP}$ that Moe loved ~~who~~] and Dan [$_{CP}$ that Kurt hated ~~who~~]?

Once again, an external factor—the requirement of visible (i.e. phonologically overt) surface-adjacency between the CP and the word that takes it as complement—interferes in a context where licensing of null-C might otherwise be expected. This additional requirement prevents ι-integration and thereby prevents null-C.

To recap, the central tenant of the framework developed here—namely, that null-C is prohibited when C is aligned to the leading edge of a prosodic boundary—remains intact throughout the discussion of non-bridge verbs, clefting, right-node-raising, and gapping. In each case, additional properties of the various constructions may conspire to prevent ι-

integration in a straightforward way and prohibit null-C. Furthermore, this account is distinguished from other accounts because it does not need to assume anything particularly special or controversial about syntax-prosody mappings: only that ι-phrases are inserted around CPs and are subject to ι-integration in certain structural contexts. Combined with the stress-based approach to phonological phrasing advocated in foregoing chapters, this means that the availability of null-C is simply a matter of phonological reduction in domain-internal position, matching up with other well-established process of domain-internal reduction (lenition/flapping and word-initial segment-deletion). With this said, I now turn to the remaining C-effects introduced in section 5.2 above, both of which manifest under the formation of non-local dependencies (i.e. syntactic movement) targeting the subject of a clause.

5.4 Addressing Other C-Effects

5.4.1 The *That*-Trace Effect

The system advocated for here does not make any specific prediction about how null-C should be dealt with in contexts where the subject has been extracted. It does, however, allow for null-C to be selected in these contexts, since extraction from embedded CPs (subject- or object-extraction) is only available when the CP is a complement. This leads us to the conclusion that there is some independent factor that comes into play in the facilitation of subject-extraction or its parsing that creates pressure for the null form of C to be selected.

In section 5.3, we saw that one of the major distinguishing properties of prosodic accounts of C-effects is their approach to the visibility or non-visibility of phonologically null material at the level of prosodification. Authors like An (2006) and Kandybowicz

(2007) both assume that null material is visible, and that the violation characterizing *that*-t effects involves the illicit alignment of null material to prosodic boundaries. Sato & Dobaishi (2012) explicitly reject the idea that null material would be visible to prosody and instead develop a framework whereby the violation stems from constraints on the prosodic phrasing of function words. In spite of this, Sato & Dobaishi reintroduce reference to null material in their attempt to explain how *that*-t effects are ameliorated in certain syntactic contexts but not in others. In previous chapters, I have already explicitly aligned with Sato & Dobaishi by rejecting the notion that the system of prosody or phonology has access to syntactic material that is null. This is represented by the principle in (51), repeated from Chapters 3 and 4.

(51) **Invisibility of Phonologically Null Terminals (IPNT):** Syntactic terminals that lack associated phonological material are ignored/invisible at the interface with prosody.

This means that in cases where subject-extraction comes into play, the obligatory selection of null-C cannot be in response to a null trace or copy of the extracted subject, which counts as a set of syntactic terminals lacking phonological content. Only the surface form will be available to evaluate whether or not some violation has occurred.

(52) a. *Who did Sue think that left?

b. Who did Sue think left?

At this point, there are actually two distinctly different approaches available to us for characterizing the violation involved in *that*-t contexts. Either the violation arises in Narrow Syntax (NS) or the violation arises postsyntactically (i.e. after spell-out). The first approach is the one taken by Franks (2000, 2005), Chomsky (2013, 2015), and many

others. In essence, something about the process of extracting the subject-phrase prohibits the structural presence of C. The prediction of such an account is that C is not just phonologically null or reduced, but that it is truly syntactically absent. In other words, the clause following the verb *say* in (52b) is not a CP, but a TP.

This is clearly inconsistent with the approach to C-effects developed here. We have assumed throughout that null-C is still syntactically present, and that its phonological nature is a property of its prosodic position, just as with numerous other functional categories in English which are syntactically present but undergo phonological reduction. Claiming that *that*-t contexts involve a completely different phenomenon—not just a phonologically null C, but an absent C—is incongruent with this line of reasoning. If we were to maintain such a distinction, questions of learnability immediately arise. How is the child-learner to distinguish when C is phonologically null and when it is syntactically absent? The likelihood of both null-C and absent-C being postulated in the acquisition process is vanishingly small, since the distinction would have to be acquired purely on the basis of negative evidence, which is never relevant in the acquisition process (Yang 2013).

Another argument against locating *that*-t violations in NS comes from variability in the effect. Conceptually, if extraction of a subject in the presence of C creates some kind of syntactic violation, we would expect such violations to show up across languages very consistently, if not universally,. However, while the existence of *that*-t effects in dialects of English is not in doubt, its robustness and universality is extremely questionable. Work by Sobin (1987, 2002), Cowart (1997, 2003), and Chacón, Fetters, Kandel, Pelzl & Phillips (2014) has shown that the strength of the *that*-t effect is variable amongst English

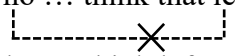
speakers—even speakers of equivalent dialects. This does not mean that some speakers have the effect, while others simply do not, but it does stress that the character of the violation involved is more subtle than has been appreciated.

This is important, since the *that*-t effect has occupied a prominent place in syntactic theorizing historically. Although similar effects have been identified in other languages from an early stage (see Pesetsky (forthcoming) for an overview), it is far from a crosslinguistically universal phenomenon, and many languages which have subject extraction in embedded clauses show no such C-related asymmetry or asymmetries that are dialectally-conditioned (see Perlmutter (1968) for Serbo-Croation and Spanish; Rizzi (1982) for Italian; Featherstone (2005) for German; Reuland (1983), Bennis (1986), and Den Dikken et al. (2007) for Dutch; Lohndal (2007) for Norwegian).

For these reasons, I will not adopt the option whereby *that*-t violations arise in NS. Instead, the second option, whereby the violation arises at a postsynactic stage, is more attractive. However, because at the level of spell-out null phonological material is no longer available, the special properties of *that*-t effects cannot simply be directly attributed to the string-context following C. The violation must instead arise by some other means, and the resolution of that violation must specifically involve the selection of null-C.

At its core, the *that*-t violation must stem from the existence of a long-distance dependency in a sentence. In (52) above, the relevant dependency is between the subject of the embedded clause (the displaced word *who*) and the verb *left*. The complementizer *that* somehow degrades the establishment of this dependency if it intervenes.

(53) a. who … think that left



b. who … think left

The nature of dependency-formation is well-studied from the perspective of language-parsing, and two important outcomes of that work will be relevant here. The first is the idea that the resolution of non-local dependencies between words ("filler-gap" dependencies) is influenced by an economy-principle called the "Active Filler Strategy" (Frazier and Clifton, 1989; de Vincenzi 1991), which states that the parser attempts to discharge filler-gap dependencies as soon as possible, i.e. as soon as an adequate candidate-word is reached. This strategy has been found to be relevant in the processing of *wh*-dependencies for both arguments (Stowe 1986) and adjuncts (Stepanov & Stateva 2015) across languages.

The second outcome is related to how expectations or probabilities arise in the parsing process. Since natural language is conveyed incrementally (word-by-word, morpheme-by-morpheme, etc.) and because syntactic structure is built on-line, part of the challenge faced by the language parser is to constantly re-evaluate a partially-built linguistic representation and to predict future steps in the construction process in the light of information (lexical, structural, semantic, pragmatic, etc.) that has already been received (see Jurafsky 2003 for an extensive overview).

One of the ways that this manifests is in the parsing of verbs which allow clausal complements. In (54) below, when the parser reaches the verb *thought*, the lexical properties of the verb inform the parser that (i) there will very likely be another phrase following the verb, since it is typically transitive, and (ii) that this phrase could be either

DP or a CP, since the verb is lexically-specified to allow both. Thus, both (54a) and (54b) could be continuations of the sentence.

(54) Sue thought$_V$ **…**

a. Sue thought$_V$ [$_{DP}$ many things]

b. Sue thought$_V$ [$_{CP}$ that Kurt left]

While the presence of another phrase following *thought* can be straightforwardly predicted by the parser based on usage-frequency, the categorial identity of that phrase is a point of ambiguity that can only be resolved by further processing of the string. Consider now what happens when we introduce a non-local dependency into the string. In (55) below, the parser processes [$_{DP}$ *who*] and knows that it constitutes a filler which must be discharged into a gap somewhere in the string which follows. At the same time, the parser has proceeded to a point beyond the stage where the ambiguity of the phrase following *think* is a problem. The complementizer *that* shows clearly that a CP follows, and this indicates that discharge of the *wh*-filler will have to be postponed.

(55) [$_{DP}$ Who] did Sue think$_V$ [$_{CP}$ that$_C$ …
┗---------- ??

Now consider how the next steps in such a derivation either generate or avoid a *that*-t violation. In Sections 5.2 and 5.3 I showed how a *that*-t effect arises when *that* is immediately followed by a finite verb (=56a-b) or (as noted by Hasegawa (2003)) an adverb like *just* or *often*, which strictly marks the left edge of the VP (=56c), as well as TP, by implication. In contrast, when *that* is followed by a sentential adverbial (=57a) or a parenthetical constituent (57b), the effect is ameliorated.

(56) a. *[$_{DP}$ Who] did Sue think$_{V}$ [$_{CP}$ that$_{C}$ [$_{TP/VP}$ has$_{Aux}$ …

b. *[$_{DP}$ Who] did Sue think$_{V}$ [$_{CP}$ that$_{C}$ [$_{TP/VP}$ left$_{V}$ …

c. *[$_{DP}$ Who] did Sue think$_{V}$ [$_{CP}$ that$_{C}$ [$_{TP/VP}$ just$_{VP\text{-}Adv}$ …

(57) a. [$_{DP}$ Who] did Sue think$_{V}$ [$_{CP}$ that$_{C}$, [$_{S\text{-}AdvP}$ after years and years …

b. [$_{DP}$ Who] did Sue think$_{V}$ [$_{CP}$ that$_{C}$, [$_{Parenth\text{-}CP}$ as far as you know …

It is here, I claim, that the Active Filler Strategy (AFS) can inform our understanding. In each of these sentences, the parser attempts to discharge the filler into a gap as soon as possible. This means that an attempt will actually be made to discharge the filler at *think*, leading to a processing slowdown (see Stowe 1986), but this option will be rejected when the string is further processed. In (56a-b), the next point where the parser can attempt to discharge the filler is immediately after *that*, when the finite verb (either an auxiliary or lexical verb) is processed. In (56c), it could easily be argued that the same is true when the parser reaches the VP-adverb, which consistently marks the edge of the verbal domain. This is why I have annotated (56c) to indicate that the parser is able to postulate both a TP- and VP-bracket as soon as it reaches *just* (the same is true of the auxiliary *has*). The question remains: if the parser is able to discharge the filler without problem in (56a-c), why should there be a violation?

The answer has to do with the nature of C. In each of the sentences in (56), the context immediately following *that* renders the CP-bracket that the parser previously established redundant. The presence of another finite lexical verb, auxiliary, or VP-marking adverb is sufficient to cue the presence of another full sentence in this context. However, the redundancy of *that* is not enough to push for its elimination from the sentence. Instead, we may appeal to the AFS for this: the selection of overt *that* in (56) essentially delays

the discharge of the filler-gap dependency initiated by *who*. Prosodically, nothing prevents null-C from being selected, and so, overt *that* being redundant when it is followed by the items in (56a-c), this creates additional pressure for the selection of null-C. In other words, if *that* were removed, the filler-gap dependency could be discharged immediately after *think*.

(58) a. *[$_{DP}$ Who] did Sue think$_{V}$ [$_{CP}$ [$_{TP/VP}$ has$_{Aux}$ …

b. *[$_{DP}$ Who] did Sue think$_{V}$ [$_{CP}$ [$_{TP/VP}$ left$_{V}$ …

c. *[$_{DP}$ Who] did Sue think$_{V}$ [$_{CP}$ [$_{TP/VP}$ just$_{VP\text{-}Adv}$ …

This is not the case, however, in (57) above. In these sentences, *that* is not immediately followed by a word/constituent which allows for discharge of the filler-gap dependency. Instead, it is followed by constituents which do not necessarily cue the postulation of a VP/TP: sentential adverbs which may occur before, after, or internal to a sentence, and parentheticals which may be inserted at various non-deterministic points. Thus, the presence or absence of *that* in these sentences does not strongly affect the timing of the filler-gap discharge, since the parser will still have to hold the filler-gap dependency until the intervening constituent is processed.

(59) a. [$_{DP}$ Who] did Sue think$_{V}$ [$_{CP}$ that, [$_{S\text{-}AdvP}$ after years and years … ??

a'. [$_{DP}$ Who] did Sue think$_{V}$ [$_{S\text{-}AdvP}$ after years and years … ??

b. [$_{DP}$ Who] did Sue think$_{V}$ [$_{CP}$ that$_{C}$, [$_{Parenth\text{-}CP}$ as far as you know … ??

b'. [$_{DP}$ Who] did Sue think$_{V}$ [$_{Parenth\text{-}CP}$ as far as you know … ??

We can therefore view the *that*-t effect not as a result of a syntactic or prosodic constraint, but as the result of a general principle of economy that comes into play during the parsing process. The availability of a null counterpart of *that* in English allows for faster discharge of filler-gap dependencies in some sentences, but not in others, and this is the reason why the *that*-t effect can be ameliorated when it is followed by specific constituent-types.[34] Under the set of principles adopted in this work (the prosodic licensing of null-C, the IPNT, etc.), an explanation in terms of general surface-level parsing constraints fits well with the nature of the *that*-t effect as a non-universal, partly language-specific property of non-local dependency resolution.

5.4.2 Tangent: Other *X*-Trace Effects

It should be noted that *that*-t effects are actually a subset of a larger class of effects involving gaps in subject positions following categories like C or *wh*-items. De Chene (2000) provides a detailed breakdown of other so-called *X*-t effects.

(60) a. *That's one problem Jim can't figure out **how** __ is gonna be solved.

b. *That's one problem Sue's going to be relieved **when** __ is solved.

c. *That's one meeting I'll be really happy **if** __ is canceled.

d. *That's the kind of problem Jim always falls asleep **while** __ is being explained.

[34] Kandybowicz (2007), following de Chene (2000), identifies additional contexts in which the *that*-t effect is supposedly neutralized: contrastive focus intonation on the verb preceding *that* and contraction of an auxiliary to *that* over the subject gap.

(i) a. ?Who do you think that **WROTE** Barriers?
b. Who do you suppose **that'll** leave early?

Ritchart, Goodall, & Garellek (2016) have demonstrated experimentally, however, that neither of these effects is specific to the *that*-t effect itself. Instead, they found that focus-assignment improved speaker-judgements across the board, not just *that*-t violations, and speakers reported no significant improvement with contraction, contradicting Kandybowicz's judgments. Accordingly, we will set these specific cases aside.

e. *That's one problem Jim's going to bite his nails **until** __ is solved.

f. *That's one film Sue wants to be in her seat **before** __ starts.

Notably, if the account of *that*-t effects put forward above is on the right track, all *X*-t effects might be expected to pattern together in terms of amelioration, but this is not the case. Thus, insertion of adverbs and parentheticals after the gap does not improve the acceptability of these sentences.

(61) a. *That's one problem Jim can't figure out **how**, for all intents and purposes, is gonna be solved.

b. *That's one problem Sue's going to be relieved **when**, for all intents and purposes, is solved.

c. *That's one meeting I'll be really happy **if**, for all intents and purposes, is canceled.

d. *That's the kind of problem Jim always falls asleep **while**, for all intents and purposes, is being explained.

e. *That's one problem Jim's going to bite his nails **until**, for all intents and purposes, is solved.

f. *That's one film Sue wants to be in her seat **before**, for all intents and purposes, starts.

This might seem to count against the proposal made for *that*-t effects above. However, while it is true that a violation occurs in these contexts, it is not necessarily the case that the violation is identical to the violation seen in *that*-t contexts. Importantly, many of the clauses cited by de Chene where *X*-t violations arise are not clearly complement-clauses. Instead, many are better-characterized as adjunct clauses, attested by the nature of the

specific complementizers involved (*if, while*, etc.). This is evidenced by the fact that, in general, extraction out of clauses headed by non-*that* complementizers is degraded, even when the item being extracted is an object (=62). Accordingly, although de Chene's discussion of these sentence-types is aimed at emphasizing the unity of *X*-t effects with *that*-t effects, the violation occurring in *X*-t contexts like (60)-(61) is clearly stronger than the violation involved with *that*-t contexts, indicating that there is something different about these cases. They are not completely homogenous with *that*-t constructions.

(62) a. ?That's one problem Jim can't figure out **how** they're gonna solve.

b. ?That's one problem Sue's going to be relieved **when** they solve.

c. ?That's one meeting I'll be really happy **if** they cancel.

d. ??That's the kind of problem Jim always falls asleep **while** the teacher's explaining.

e. ??That's one problem Jim's going to bite his nails **until** they solve.

f. ??That's one film Sue wants to be in her seat **before** they start.

I will not delve further into this issue, except to point out that, although both *that*-t and *X*-t effects involve some kind of subject-object asymmetry, it is not the case that all subject-object asymmetries must be unified. A strong subject-object asymmetry arises, for example, under parasitic gapping, but it is unclear if the origin of this asymmetry is exactly the same as the one found in other contexts. It is important not to gloss over subtle distinctions in the origin of specific violations in the pursuit of a unified theory.

5.4.3 Relative Clauses and the Anti-*That*-Trace Effect

One aspect of the account articulated above that has not yet been addressed is the syntactic nature of (6), repeated below:

(6) Sue ordered **a book** that/Ø Kurt had written.

Thus far, I have simply treated the licensing of null-C here as in parallel with other contexts, such as a verb or adjective taking a CP-complement. However, (6) is an example of a relative clause (RC) formation, whereby a CP attaches to and modifies a nominal item and a dependency is formed between the nominal item and a position internal to the CP. In (6), *book* is interpreted as both the object of *ordered* in the main clause and the object of *written* inside the RC:

(63) Sue ordered a book [$_{\text{CP-RC}}$ **that/Ø** Kurt had written __]

A comprehensive syntactic analysis of RCs is beyond the scope of this work[35], and so all that I will say on this subject is that, if the prosodic account of the licensing of null-C is to be maintained, the structural relation between the nominal item and the relative clause must be analyzed as one which matches up with head+complement relations in other contexts. This might seem problematic due to the fact that RCs are typically analyzed as adjunct-phrases (Chomsky 1977, Browning 1991). If this is true, then the adjuncthood of RCs must be of a different character than the adjuncthood of other CPs, i.e. CPs in non-bridge contexts where ι-integration is disallowed. This is not difficult to justify given the basic properties of RCs, which require the formation of a non-local dependency, i.e. movement or extraction, which is typically prohibited in non-bridge contexts (although there is still strong debate about the precise nature of the dependency involved in RC-formation).

[35] See Chomsky (1977, 1993), Carlson (1977) Heim (1987), Browning (1991), and Kayne (1994) for important background. In particular, I will not address the nature of the dependency formed between the relativized nominal item and the RC-internal position—whether this dependency is formed by movement, as Kayne (1994) argues, or some other operation.

Setting this case aside, one final C-effect remains to be addressed in relation to RC-formation, as discussed briefly in section 5.2 above. The sentence in (6) involves an object-RC, and null-C is licensed in this context. When the nominal that an RC modifies targets the subject position of the RC, however, null-C is no longer licensed. This is termed the "anti-*that*-t effect", essentially the inverse of the classic *that*-t effect. (64) is adapted from (15) above.

(64) **A package** [$_{\text{CP-RC}}$ **that/*Ø __** just arrived] was unwrapped.

Crucially, the anti-*that*-t effect only arises when the modified nominal (*a package* in (64)) and the gap within the RC are both adjacent to the C of the RC. In other words, null-C is prohibited if C is flanked by the nominal and its gap. If the extracted NP is non-local to C then the *that*-t effect takes over, and null-C may be selected for the C of the RC[36].

(65) I picked up **a package** [$_{\text{CP-RC}}$ **that/Ø** I found out [$_{\text{CP}}$ ***that/Ø __** had just arrived]]

It is unclear how to bring to bear the principles of prosodic licensing that have been developed so far in order to account for this phenomenon. In order to capture object-RCs, it cannot be assumed that RCs are adjuncts in the same way the non-bridge CPs are adjuncts. Likewise, external pressures like coordinate-parallelism cannot be invoked to account for the non-licensing of null-C here. Thus, rather than rely some exceptional property of the prosodic licensing of null-C, I believe that, as in the case of *that*-t effects, the simplest explanation for these facts comes from surface-level constraints on parsing,

[36] An exception to this is found with rightward extraposition of the RC, as in (i):

(i) [$_{\text{DP}}$ **A package]** __$_{\text{CP-RC}}$ was unwrapped [$_{\text{CP-RC}}$ **that/*Ø __** $_{\text{NP}}$ just arrived]

In this case, the anti-*that*-t effect stills holds despite the fact that C is no longer flanked by the NP and its gap. This is immaterial, however, under the assumption that extraposition occurs *after* the formation of the NP+RC relation.

following proposals articulated by Bickerton (2014:175). In essence, the prohibition on null-C in (64) is directly related to the fact that both the extracted nominal and its gap flank C. If C were null in (64), the outcome would be as in (66), creating what is essentially a garden-path sentence, requiring a complete overhaul of the syntactic parse once the word *was* is encountered. The same is true, but to a lesser extent, in (67), where the nominal modified by an RC occupies an object position in the main clause.

(66) *A package just arrived was unwrapped.

(67) *I ordered a package just arrived.

The danger of creating a garden-path sentence is eliminated in contexts like (65) and elsewhere, since the extracted nominal and its gap do not flank C. Thus, although the framework developed here predicts that null-C should be available in this context, parsing considerations push for its exclusion in order to prevent widespread sentential ambiguity.

5.5 Conclusion

In this chapter, I have developed an approach to C-effects which unifies the (non-)licensing of null-C with the (non-)licensing of other forms of phonological reduction that apply to function words generally in English. The connection between contexts in which phonological reduction is prohibited (i.e. at the leading edge of prosodic domains) and contexts in which null-C is prohibited has not been clearly identified previously, and therefore the proposals made here can serve to move our understanding of C-effects forward. I have addressed the licensing of null-C in contexts where the ι assigned to a CP can be integrated into the ι of a larger domain, and I have extended our prosodic and

syntactic understanding of constructions with non-bridge categories, clefting, right-node-raising, and gapping.

Furthermore, this account of C-effects patterns with work by, e.g., Bošković & Lasnik (2003), in that it begins by developing a framework for understanding the licensing of null-C in general, and then moves to specific, narrower constraints like the *that*-t and anti-*that*-t effects. This is important, due to the exceptional properties of these narrower effects, their manifestation in the formation of non-local dependencies, and their non-universality across languages (especially in the case of *that*-t effects). Basing a theory of syntax-prosody on domain-specific effects like the *that*-t or *X-t* phenomena will be less effective in the long run and prone to make incorrect predictions in terms of linguistic variability.

In contrast, the licensing of null-C in specific prosodic environments (i.e. internal to prosodic domains) is a robust and well-grounded proposal since it fits in with a much broader understanding of the impact of prosodic boundaries on morphophonological forms, such as the widespread crosslinguistic phenomenon of "domain-initial strengthening".[37] Ultimately, this approach to the classic problem of the licensing of null-C in English is more congruent with empirical data and more explanatorily adequate, and future work will aim at its application to other related phenomena involving alternations between full and reduced/null morphophonological options.

[37] Fougeron & Keating (1997), Cho & Keating (2001), Fougeron (2001), Keating, Cho, Fougeron & Hsu (2003), Keating & Shattuck-Hufnagel (2002), Keating (2003)

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